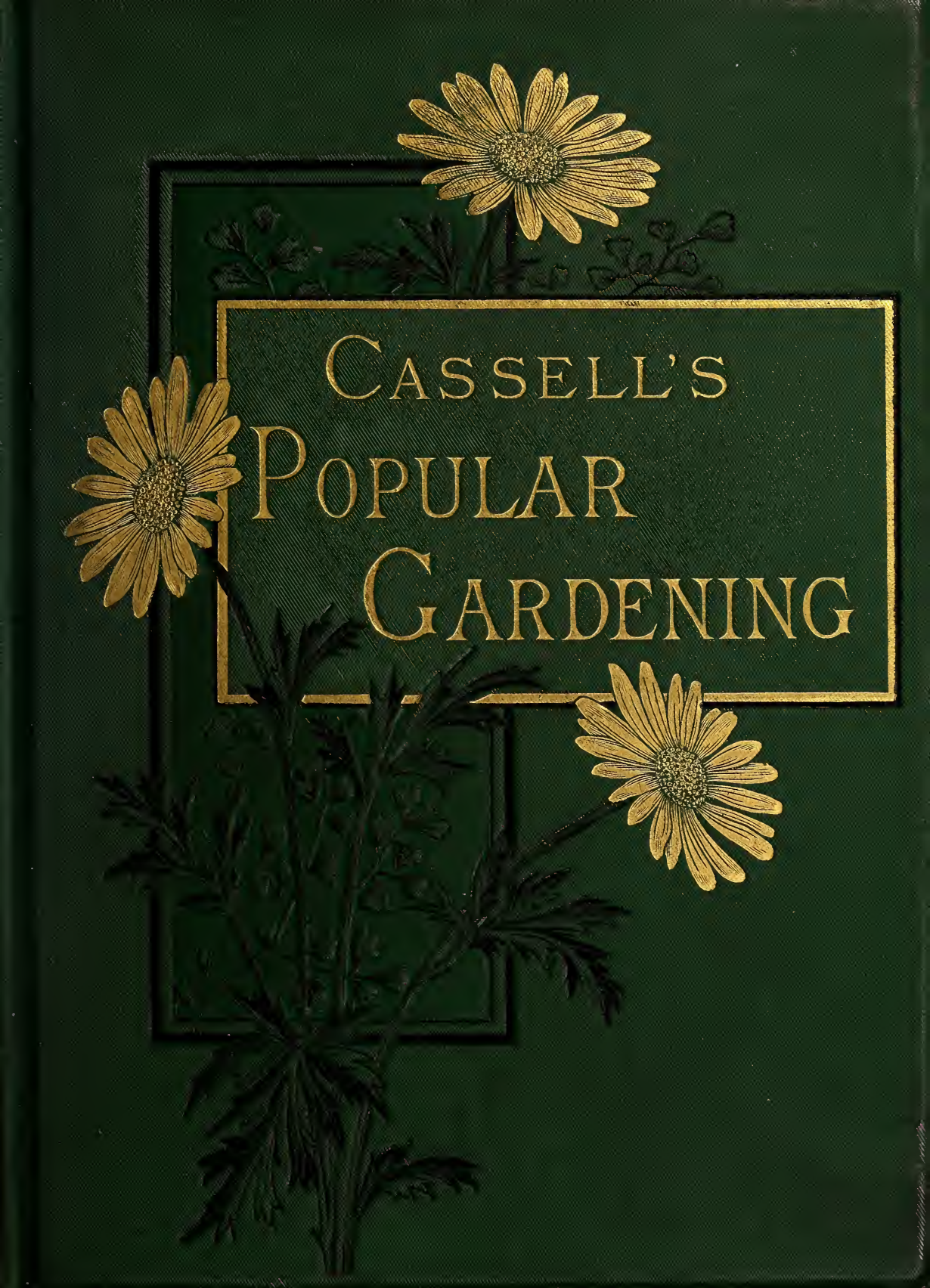
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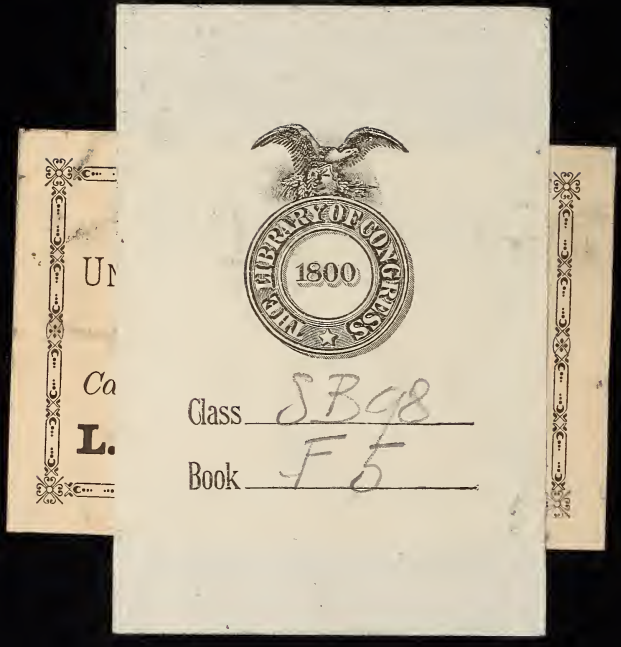
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CASSELL'S
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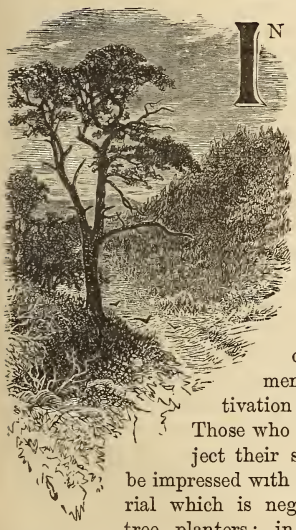
TREES AND SHRUBS.

By George Nicholson.



IN these articles it is intended to give a series of notes on the more noteworthy trees and shrubs suitable for open-air cultivation in the British Islands. No plant will be included simply because it is new or rare, and only those which can be safely recommended for general cultivation will be mentioned. Those who have given the subject their study cannot fail to be impressed with the wealth of material which is neglected by so many tree-planters; in comparatively few places do we find anything like a collection of trees and shrubs. Everywhere we meet with the Common and Portugal Laurels, Box, Laurustinus, &c., and yet there are numbers of plants equally deserving of cultivation, which by their foliage or flower would add an additional charm to many an English garden, if only their proprietors could be induced to cease from continuously ringing the changes on the old well-known favourites, and to try others, less familiar it may be, but equally meritorious. Amongst deciduous trees much may be done to beautify the park and pleasure-ground by judiciously planting a selection of the less-known hardy species; some of these are superior in general effect to most of those which are met with every day. Variations in habit, in the form and colour of the leaves—both in a young state and during decay in autumn—are endless, and with but little trouble charming combinations, and fine permanent, as well as novel effects, could be created. No scientific classification or sequence will be followed; the plan here adopted is to compress into the space at command a series of the best conifers, deciduous and evergreen flowering trees and shrubs. Where many species are mentioned they will, for convenience of reference, be arranged alphabetically, and a short paragraph given to each.

The Acers (*Maples*).—Amongst the numerous genera which are laid under contribution for the decoration of English parks and gardens, not one affords a greater proportion of thoroughly desirable hardy ornamental trees and shrubs than *Acer*. Not a few are well known, and deservedly occupy a high rank in the estimation of the landscape gardener; among those mentioned below, however, are many which are equally as ornamental as the commoner kinds, and in some respects superior to them. The genus *Acer* contains about fifty species, and is distributed throughout Europe, North Asia, North America, Java, and the Himalayas. Those from the two last-mentioned regions are not hardy in this country; although some of the species from the Himalayas have to bear in their native habitats much more cold than they would ever experience in Britain, they, as a rule, commence to grow too soon in this country, and the late spring frosts prove too much for the young tender shoots. For the purpose of the general planter, then, it is intended to omit all mention of the species hailing from the regions in question, and to confine ourselves to those on which

more dependence can be placed. As a rule, trees of large size (and many of the Maples come under this category) have very inconspicuous flowers; but several of the members of the genus now under review have decidedly showy brightly-coloured flowers; the Norway Maple, with its large clusters of yellow flowers, and the Red or Swamp Maple of the United States, with its deep red ones, being cases in point. Then, for wonderful variety in the form of the leaves, in their colour when growing, and in the autumnal tints assumed by the decaying foliage, the genus probably stands alone. For convenience of reference the species enumerated are arranged alphabetically, and where nothing is said about requirements of soil, &c., it may be assumed that they are by no means particular in this respect, but will thrive under very varied conditions.

A. argutum.—This recently introduced Japanese species has long-stalked five-lobed leaves, the long-pointed serrated lobes giving a distinct character to the foliage. The long-clustered racemes of fruits, with horizontally spreading wings, are handsome in the native specimens of this tree; as yet, it has not fruited in this country. Judging from its habit and growth, &c., it will make a small tree with somewhat slender twiggy branches.

A. campestre.—The only truly native Maple in the British flora. It varies considerably in the size and character of foliage, &c. Under favourable conditions old trees often attain a height of thirty feet or more. This does not make a bad hedge plant, and when cut down frequently, the young shoots and leaves are suffused with a vinous-red tint, and the leaves are much more deeply cut than are those of old trees which have not been subjected to severe pruning. In gardens there is a variety of this species, with the leaves covered with small specks or blotches of white, *pulverulentum;* and another; *Austriacum*, a green-leaved form, with larger foliage, altogether a stronger and more robust plant than the ordinary *A. campestre*, which in a wild state occurs in West Asia, and in Europe from Denmark southwards.

A. carpinifolium—the Hornbeam-leaved Maple—is a Japanese species recently introduced to British gardens by Messrs. Veitch. It is wonderfully distinct from ordinary Maples in the form and veining of its leaves. In Japan it is said to grow fifty feet in height.

A. circinatum is a distinct and desirable bush, with round heart-shaped leaves, with seven or nine sharply acuminate lobes. In spring the long crimson leaf-scales form a striking contrast to the tender green of the young leaves, and the flowers, too, are conspicuous by reason of the large purplish-red sepals. The rich orange-red tints assumed by the decaying leaves of this species are especially attractive. In its native habitats—Northern California to Puget Sound—*A. circinatum*, forms a tree thirty to forty feet high, but frequently occurs as a bush, forming impenetrable thickets along streams, the Vine-like stems taking root wherever they touch the ground. Under cultivation it grows well in dry, gravelly soil, but by ornamental water, where its roots would have an abundance of moisture, or in richer ground, it would probably grow much faster than in dry poor soils.

A. cratægifolium owes its specific name to the resemblance between its pretty dark green foliage and that of the Hawthorn. It is a slender tree, which, when in flower, is a handsome object; it has few-flowered racemes of rather large, white blossoms, followed by peculiar long-stalked, horizontally winged fruits. A variegated form of this, *A. c. Veitchii*, is a vigorous garden sport, with finely variegated rose and dark green leaves. A Japanese plant, recently introduced to British gardens by Messrs. Veitch.

A. dasycarpum—the White or Silver Maple of the Eastern United States — is a fast-growing tree of the first rank for ornamental purposes. Both in its native country and elsewhere, this is now largely planted as an avenue tree and for shade; in early spring the rosy-tinted small flowers clothe the leafless branches, and cause a group of trees to form a pleasing effect in the landscape. The foliage is a deep green above, and silvery-white beneath; in autumn it turns to a clear bright lemon-yellow. The wood is but of little value, but the graceful habit of the tree, its quick growth, and its handsome foliage, make it one of the best of all deciduous ornamental trees for the landscape gardener. There is a weeping form (*pendula*), and another (*aureo-variegata*) with leaves irregularly variegated with yellow. Amongst the numerous names under which the Silver Maple is mentioned in books, &c., and found in gardens, are *A. eriocarpum*, *A. glaucum*, *A. Virginicum*.

A. diabolicum, a Japanese Maple with large, handsome foliage, is perhaps better known under its garden name of *A. pulchrum;* the large, yellowish flowers are produced in early spring in rather short, clustered racemes, from below the termination of the shoots; these are followed by large, hairy fruits, with ascending wings. As yet, probably no large plants of it exist in this country, but in Northern France we have seen it of considerable size; it makes a noble tree, with large, ciliated, Plane-like leaves.

A. hyrcanum is a neat, compact, slow-growing species, suitable for a single specimen on a lawn, &c.; it has bright red leaf-stalks, and five-lobed

leaves, bright green above and glaucous beneath, which in autumn turn to a brownish-yellow. It is a native of Western Asia, and is found in gardens under the names of *A. caucasicum*, *A. ibericum*, and *A. tauricum*.

A. insigne—a native of Eastern Persia—resembles the common Sycamore in foliage, but differs a good deal in the inflorescence, which is an erect panicle. This species, too, is very remarkable on account of the lateness of the season when growth commences; it is later in developing leaves than any other Maple, or than even the Oak or Ash; in late spring the large crimson leaf-scales are very conspicuous.

A. japonicum is a Japanese bush, with leaves much like those of the United States *A. circinatum*, and large deep purplish-red flowers.

A. Lobelii, from the mountains of Southern Italy, is a distinct Maple, related to the Norway Maple, *A. platanoides*, but differs markedly in its more erect fastigiate habit, and in the firmer texture and somewhat different tint of its leaves; the young shoots, too, are clothed with a bluish-grey glaucescence.

A. macrophyllum, a Californian species, has large, downy, Plane-like leaves, and long, dense, pendulous racemes of greenish-yellow flowers, which are followed by large, hairy fruits. When in flower, before the full development of the leaves, as well as when in fruit, this Maple is a decidedly distinct and ornamental one; it is, moreover, a very rapid grower.

A. monspessulanum, from North Africa, South Europe, and Western Asia, makes a dense round-headed tree, and is ornamental either when clothed with its pendulous pale yellow corymbs, or when laden with its clusters of reddish fruits; the leaves are firm in texture, and dark green in colour, with three entire lobes. This will grow, and flower and fruit freely, in poor, dry, gravelly soils, but under more favourable conditions will attain a much larger size in the same time; it varies in height from fifteen feet (or even less) to forty feet.

A. opulifolium.—A species very widely distributed throughout the Mediterranean regions; it forms a bush or small tree, with generally five-lobed, red-stalked, hairy leaves. The yellowish flowers are developed from near the tips of the branches, just before the appearance of the leaves. The variety *obtusatum* is a much stronger grower, and attains a height of forty feet or more; the leaves, too, are larger, of a darker green, and are densely clothed beneath with a rusty-coloured tomentum. The decaying foliage assumes a rich brown tint in autumn.

A. palmatum.—Probably no single species of any deciduous shrub or tree hardy in Great Britain exhibits so extreme a range of variation in colour, form and size of foliage, &c., as this, which not unfrequently is met with in books under the name of *A. polymorphum*. It is a native of Japan, and like so many of the plants from that wonderful horticultural region, it has been cultivated by the Japanese from time immemorial. A good many gardeners seem afraid to trust out of doors the different bright-coloured forms of this beautiful deciduous shrub, but if they were to give them a fair trial the result in the great majority of instances could not fail to be eminently satisfactory. At Messrs. Veitch's they grow freely in a cold, clayey gravel, on somewhat exposed banks; in other spots they flourish in a peaty soil. Only a selection of the more remarkable of the numerous varieties are here mentioned; for a full account of the species and its variations the reader is referred to the *Gardeners' Chronicle* for July, 1881. The ordinary type, which represents one group of forms, has generally small, green, deeply five-lobed leaves; the *septemlobum* group have somewhat larger leaves, with seven or nine lobes; and the *dissectum* series have leaves with seven or nine deeply pinnatifid overlapping lobes.

Of these three sections there are a regular series of forms varying in colour, &c. Of the *palmatum* set, *A. p. aureum*, a good grower, with long-stalked rather large leaves, light green and yellowish when young, gold and orange-scarlet in autumn, is one of the best. *A. p. crispum*, with red-stalked, curled green leaves, and a habit like that of a miniature Lombardy Poplar, is also both distinct and desirable. Amongst the best of the remaining forms are *A. p. linearilobum*, with long, almost entire, very narrow lobes, and sports from this bearing distinctive names in nurseries, with purple or rich red foliage. Some of the stronger growers of the *septemlobum* group are used as stocks on which to graft the weaker growers. The following is a selection of the best and most distinct members; *sanguineum* and *atropurpureum* have red and dark purplish leaves respectively; *s. elegans* has narrow deeply-cut lobes, light green in colour, suffused with red when young. *S. variegatum* has young leaves and stalks red, the older ones splashed with rose and white. The *dissectum* group are all very beautiful plants, with finely-cut, Fern-like foliage; the type has light, bright green leaves; *d. tinctum* has the leaf-margins tinged with red, and in *d. ornatum* the whole leaf is a uniform deep red.

A. pennsylvanicum, from the Eastern United States, is best known in English nurseries under the name of Snake-bark Maple. If only on account of the beauty of its bark—which in the young wood is green, beautifully striped with white and black—this should be very generally grown. It attains a

height of twenty or thirty feet, with a trunk six or eight inches in diameter; it has finely serrated, three-lobed, heart-shaped leaves, six or seven inches long, by five or six inches broad; when young, hairy on both surfaces—the under one especially clothed with a dull yellowish tomentum—but glabrous when mature. The flowers are greenish, in long, slender, pendulous racemes.

A. pictum—a native of Japan and other portions of Eastern Asia—varies considerably in habit, size, &c. The best known, and from a garden point of view the most valuable, of the varieties is *A. p. rubrum*, familiar to many readers under its nursery name of *A. Colchicum rubrum*. This form is a strong grower, with brownish bark, and with leaves which, throughout the season, retain a purplish-red tint. The green-leaved state of the variety just named only differs in the colour of the foliage.

A. platanoides—the Norway Maple—is a noble tree, with olive-brown shoots, dark glossy-green Plane-like leaves, and yellow flowers, followed by fruits with spreading wings. The type is found throughout Europe, and is one of the most ornamental of early-flowering trees; it possesses an additional advantage in its leaves being scarcely ever damaged or disfigured by insects. A considerable number of varieties of this fine tree are in cultivation. *A. p. laciniatum* is a somewhat slender, sparingly branched, small tree, with deeply-cut leaves, crowded at the ends of the shoots. *A. p. cucullatum*, the Eagle's-claw Maple, has deeply-cut lobes with the edges turned downwards so as to look like the half-closed foot of a bird. *A. p. globosum* is a form with a dense, round, compact head; this keeps in shape and requires no cutting; it is thoroughly suitable for a single specimen on a lawn, or for any spot where a small-growing, formal, round-headed tree is required. *A. p. Schwedleri* has large, handsome, deep bronzy-red leaves, and is one of the best of ornamental foliage trees; it is, moreover, a vigorous grower. Similar in character to this last are *A. p. purpureum* and *A. p. Reitenbachii;* they only differ somewhat in their shades of purple-red from *A. p. Schwedleri*.

A. Pseudo-platanus—the Great Maple, Sycamore, or Plane of Scotland—is a native of Central Europe, and Western Asia. As a forest tree of the first rank, and producing valuable timber, it has been largely planted, and is naturalised in many places. Many varieties have originated either as seedlings or as sports, and the more noteworthy of these are mentioned here. *A. p. Leopoldi* has leaves prettily marked with purplish and flesh-colour on a green ground; it is one of the best of the variegated forms. *A. p. flavo-marginatum*, the Corstorphine Plane, has distinctly yellow leaves during the early portion of the season; it is only as the leaves mature that the very conspicuous golden tint merges into a pale green. *A. p. purpureum* has leaves of a fine purple underneath. This tree, as Loudon says, has a very singular effect when the leaves are slightly ruffled with the wind, alternately appearing clothed in purple and in pale green. The purple bloom is most obvious when the leaves are fully matured.

A. rubrum—the Red or Swamp Maple of the Eastern United States—is by no means, as the latter of its English names seems to suggest, a tree which will not thrive except in very moist spots; we have seen it repeatedly in very poor sandy soil. In early spring the leafless branches are clothed with clusters of deep red flowers; the young growing shoots are reddish-brown in colour, and the leaves bright shining green above and glaucous beneath. As a rule, the leaves turn a bright, clear, golden-yellow in autumn—in the neighbourhood of London at any rate, but now and then a tree will assume a fine, glowing, red colour, similar to that put on by the species in its native woods. The wood of this species is valuable, and is largely used for cabinet-making; logs with undulating grain, "Bird's-eye Maple" or "Curled Maple," being the most highly valued. In the United States it forms a large tree, and generally grows in swamps. With us, it is not nearly so fast a grower as the Silver Maple, *A. dasycarpum*.

A. saccharinum—the Sugar or Rock Maple—is one of the noblest of North American trees by reason of the beauty both of its form and foliage. This species, too, furnishes by far the greater portion of the Maple sugar consumed in North America. The foliage is not unlike that of the Norway Maple. According to Professor Sargent, the Sugar Maple attains a height of sixty or eighty feet in the uplands of the Northern United States, with a trunk two to four feet in diameter. The timber is valued by the cabinet-maker, particularly the accidental states known as "Bird's-eye" and "Curled Maple."

A. spicatum—the Mountain Maple of the Northern United States—is generally a shrub, but now and then it may grow to a height of about twenty feet. It has coarsely serrated three or slightly five-lobed leaves, and upright inflorescences. The small red-winged fruits add an element of beauty to the bushes in autumn, and the decaying leaves turn a fine reddish-yellow. In books it is frequently mentioned under the name of *A. montanum*.

A. tataricum has rather a wide range; it occurs from Eastern Europe to Japan, and varies a good deal in the size of its leaves. It is about the first of the Maples to unfold its leaves in spring, and the yellow and brown tints assumed by these in autumn are pleasing. The flowers (pale greenish-yellow in colour) are borne in short erect racemes, and are

followed by a profusion of red-winged fruits which contrast well with the dark green, generally pointed, heart-shaped, doubly-serrated leaves. In young vigorous examples the leaves are frequently very decidedly three-lobed. *A. t. Ginnala*, from Amurland, is a form with slender twigs, and prettily-cut and lobed leaves. In autumn the leaves of this variety assume a brilliant ruby-red colour; altogether it is a more graceful and smaller plant than the type, which grows from fifteen to thirty feet in height.

A. Van Volxemii is a comparatively recent introduction from the Caucasus. The foliage is not unlike that of the common Sycamore, from which it differs in the lighter green of the upper and the more silvery colour of the lower surface. The discoverer of the plant, after whom it is named, says that it grows in a wild state, intermixed with the common Sycamore, from which, however, it can be distinguished readily at considerable distances by its more columnar habit, its larger size, and different colour.

A Well-grown Horse-Chestnut.

Actinidia is a small genus of Eastern Asiatic climbers, of which a couple of species have found their way into cultivation. *A. Kolomikta* is a recent introduction; it has stalked, ovate-oblong, pointed, or heart-shaped serrated leaves, which assume a beautiful red tint in autumn. *A. polygama* has, like the last-named, white fragrant flowers, followed by edible berries. Both are desirable climbers for walls.

Æsculus (*the Horse-Chestnuts*). — This genus contains several highly ornamental trees, not the least desirable being *Æ. Hippocastanum*, the common Horse-Chestnut. For a long time the native country of this species was unknown, but it has very recently been found in a wild state in the mountains of Greece. According to Loudon it was introduced to this country in 1629. The same authority also states it to be a native of Asia and North America, but, as above explained, this is not the case. It is constantly naturalised in many countries, and is cultivated in many more. Gerard, in his famous Herbal, speaks of it only as a foreign tree, and in Johnson's edition of that work—by far the most popular of the old herbals—published in 1633, he says: "Horse-Chestnut groweth in Italy, and in sundry places in the east countries; it is now growing with Mr. Tradescant, at South Lambeth." Parkinson says: "Our Christian world first had the knowledge of it from Constantinople." He places it as a fruit-tree in his orchard, with the Walnut and Mulberry; and how little it was then known may be learned by his describing the fruit as sweet-flavoured, roasted and eaten as the common Chestnut. When in bloom no British forest-tree can vie with this in beauty, and its handsome foliage and thick growth render it one of the most effective of shade-trees. There is a host of varieties, which are readily propagated by budding or grafting on the common stock, the most important of which are mentioned below. First of all comes the double-flowered form, valuable on account of its blossoms lasting much longer than the single type. *Pendula* has weeping branches, but does not otherwise differ, and *dissecta* has the leaflets curiously slashed. The latter, however, is more curious than handsome, as are also the various variegated forms. *Æ. rubicunda*, the Scarlet Horse-Chestnut, is a beautiful tree from the United States; except in the colour of its flowers it does not differ materially from *Æ. Hippocastanum*, of which, indeed, some botanists have averred it to be a garden variety. *Æ. carnea* comes near the last, but has paler red flowers; both this and *Æ. rubicunda* are smaller-growing rounder-headed trees than the common Horse-Chestnut. *Æ. flava*, also from the United States, has yellow flowers, and makes a striking contrast with the white and red-flowered species, being quite as hardy as either. *Æ. indica* is yet rare in cultivation; it is a native of North India, and has large thyrsoid panicles of showy flowers, the lower petals of which are white, tinged with red, and the upper yellow and red, bordered with white.

The Ailantus—*Ailantus glandulosa*—is a very fast-growing (when young), and stately tree, with large, pinnate, deciduous leaves, one to two feet long. The whitish-green flowers exhale a disagreeable odour, but the tree, when laden with its red-winged fruits, is a splendid sight, and amply makes up for the small size and unpleasant scent of the flowers. If cut back yearly it makes enormous growths—as much as twelve or fifteen feet in the season—with huge leaves two or three times the size of those of old trees which have not been pruned in any way. Young plants cut down almost to the ground every year make most beautiful objects in the sub-tropical garden. When fully grown the tree is about fifty or sixty feet in height. The following sentence gives the history and date of the introduction in the introducer's (Peter Collinson) own words:—"A stately tree raised from seed from Nankin in China, in 1751, sent over by Father d'Incarville, my correspondent in China."

Alnus (*Alders*).—About fourteen species of Alnus are known. All are deciduous trees or shrubs, hailing from the temperate and cold regions of the northern hemisphere, one or two extending to the Andes of South America. *A. cordifolia*, a South European species, is a fast-growing tree, with large heart-shaped glossy leaves. It is ornamental whether in flower or leaf, and although it probably succeeds best in a moist situation, it grows freely in a dry soil. *A. firma* has sharply serrated, many-nerved, lanceolate leaves; it is a native of Japan, and one of the most distinct of all the Alders. *A. glutinosa*, the native Alder of Britain, occurs throughout Europe, North Africa, and North Asia; in a wild state it invariably affects moist spots, and is generally found fringing the banks of rivers and streams. For such places it is very useful. Some of the varieties are very interesting and pretty; the golden-leaved form, *aurea*, has the foliage the same shape as that of the type, but of a very decided golden tint; *incisa*—or, as it is sometimes called, *A. oxyacanthifolia*, on account of the resemblance between its small leaves and those of the common Hawthorn—makes a neat, round-headed, small tree or bush; *laciniata* has elegantly drooping branches and Fern-like leaves; *quercifolia* is a distinct form, with sinuated leaves, not unlike those of the common Oak in outline. All the forms of *A. glutinosa* do best in places where their roots can revel in an abundant supply of moisture. *A. incana*, the Hoary Alder, is a widely distributed species occurring in the northern regions of both hemispheres; it has distinctly glaucous greyish leaves, and affects drier situations than *A. glutinosa*; like that species, too, it possesses forms with elegantly-cut leaves. *A. viridis*, the Green or Mountain Alder, has a

similar geographical distribution to the last-named species; it has round-oval or slightly heart-shaped leaves, and is most frequently met with as a shrub from three to eight feet high. All the above are perfectly hardy in this country.

Amelanchier.—The Amelanchiers are amongst the most useful of early spring-flowering shrubs or trees. *A. canadensis*, the June Berry of North America, is a very variable species, the extremes ranging by every intermediate gradation between a tree thirty feet in height and a dwarf shrub. The leaves, too, vary much in outline. *A. c. Botryapium* is the most stately—as far as regards height—of the numerous forms which have received distinctive names, and when laden with its pendulous racemes of snowy flowers in April, is a remarkably handsome object in the park or shrubbery; the rather sweet purplish fruit—which is much used as an article of food by some of the Indian tribes—ripens in this country in June. Amongst other varieties are *ovalis*, *sanguinea*, and *almifolia*. The European *A. vulgaris* is neither so graceful in habit nor attains so large a size as the North American *A. C. Botryapium*; its branches, too, do not exhibit the spreading or weeping tendency which is often so conspicuous a feature in that plant. Nevertheless, it is a very useful plant, flowering profusely in the middle of April, or in mild seasons even in March.

Amorpha (*A. fruticosa*)—the False Indigo of the Northern United States—is a deciduous shrub of the easiest cultivation; it thrives and flowers freely in dry poor soil, and bears cutting in well. The elegant leaves are unequally pinnate, and its small purplish flowers are produced in dense terminal racemose panicles. The type attains a height of from six to nine feet, but there is a dwarf form, *nana*, about half that size or even less. A large number of names occur in some catalogues, but practically the only really distinct variety is the one just named. *A. canescens*, the Lead-Plant of the United States, is a beautiful little shrub from one to three feet in height, covered with whitish down; the dense inflorescence is a fine, rich, blue-purple. The presence of this species in the prairies and crevices of rocks, &c., in Michigan and Wisconsin, was supposed to indicate lead-ore, hence the name Lead-Plant.

Ampelopsis.—The best-known member of this genus of deciduous climbers is the Virginian Creeper, *A. quinquefolia*, one of the best of all climbers for rapidly covering unsightly walls, or for clothing arbours or old trunks of trees with a mantle of rich green. The bright crimson colour of the decaying leaves is wonderfully attractive, particularly if the plants have been growing in an open sunny spot; in shady places the colouration is never so decided. In company with Ivy on old trees, or amongst roots on banks, &c., it makes a fine show. There are several varieties, varying somewhat in size, hairiness, and form of leaves. *A. bipinnata* is not so hardy as the last-named, but its handsome twice-pinnate (not digitate) leaves make it a welcome addition to any collection of climbers; it is a native of the Southern United States, whereas the Virginian Creeper is a common creeper in the Northern United States. The genus *Ampelopsis* is now merged by most botanists into *Vitis*, but as the plants above-mentioned are so well known under the names here given, they are retained for convenience of reference in their present position. For other allied climbers see Vitis.

Amygdalus (*Almonds*).—Among the most ornamental of flowering trees during early spring, the Almonds undoubtedly occupy a high rank in the central and southern portions of Britain. *A. communis*, the common Almond, is readily propagated either by seeds or by grafting on the Plum-stock; the numerous varieties must be increased by grafting or budding. *A. c. amara*, the Bitter Almond, has large white flowers, rose-coloured towards the base of each petal; *A. c. dulcis* has red flowers, which open a little earlier than those of the Bitter Almond. Amongst the best of the forms grown in gardens are *macrocarpa*, with very large pink-tinted flowers, and *flore-pleno* with double flowers. The Almond ripens its fruit freely enough in the South of England, but is rarely cultivated except for ornament; the Almonds of the shops come principally from the South of Europe and the Levant. *A. nana*, a pretty little species from Eastern Europe, &c., only grows about a couple of feet in height; it has small, oblong-linear leaves, and solitary rose-coloured flowers, much less than half the size of those of most forms of the common Almond. *A. incana*, a Caucasian plant similar in size and habit, has red flowers, and the under surface of the leaves clothed with a hoary white tomentum.

Andromeda.—The only species now retained in the genus *Andromeda* is our native *A. polifolia*, a pretty little evergreen, which thrives in a damp peat border; it is found in a wild state in peat bogs in many countries throughout the northern hemisphere, and has stalked, linear, leathery leaves, with strongly recurved margins, and short drooping racemes of red flowers. For other plants frequently found under the name of Andromeda in catalogues and garden literature, see Cassandra, Cassiope, Pieris, Zenobia, &c.

HOUSE, AREA, AND WINDOW GARDENING.

By William Thomson.

PLANTS IN ROOMS (continued).

Double Windows.—These, if properly constructed, are a great boon to the in-door gardener. A double window is a casing of wood, projecting six inches or more into the room, going over the top of the window-frame, and resting on the floor. In front of this are hung two folding glazed doors, the whole being fastened back to the window-frame. If ledges of wood are nailed to the inner sides of the casing, shelves can be laid across for rows of pots to stand upon; and by having plenty of ledges (fillets, as carpenters call them), the shelves can be moved to different distances apart, according to the requirements of the plants. At the bottom of the casing there should be a movable zinc tray, to catch any overflow after watering, and thus prevent any damage to the carpet. The shelves must be so arranged that the window can readily be opened above and below as required when the weather is suitable. When this is done, and the folding doors are closed, the plants are enjoying fresh air without draughts. They are also protected from the dust, which is always flying about in rooms; and they require to be watered or syringed much less frequently when they are enclosed in this way. At the same time enough air must be given to prevent mildew arising from the atmosphere in which they are growing being too damp; and if the weather is too cold to allow of the window being opened, then one or both of the folding doors must be occasionally opened, and this should be done at times when there is the least dust flying about. The best time will be after the dust disturbed by the morning sweeping of the carpets has well settled, and when there is the least traffic about the room to stir it up again. Thus it would be a good time to leave the doors open when you are going for your afternoon walk.

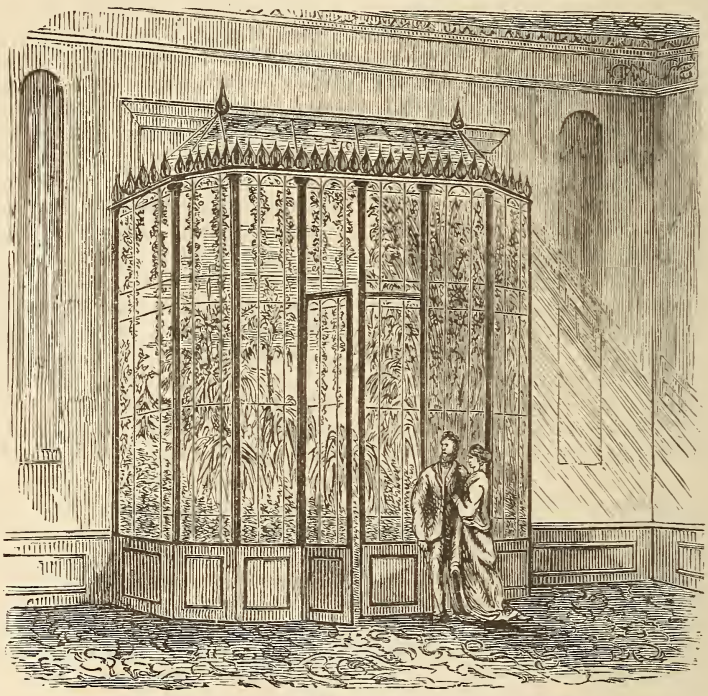


Fig. 21.—In-door Conservatory against a Window.

A modification of the double window just described is shown (Fig. 22), in which the enclosed space only goes up to the middle rail of the window, that is, only halfway up. This arrangement has an advantage over the double window, which goes up to the top, from the facility which it affords of ventilating the room by opening one or more of the upper sashes, which can be done without exposing the plants to any cold air or draught. The front of this case may consist of two doors hinged at the sides, and fastening in the middle, or of one large frame hinged along the top, and, therefore, requiring to be lifted up when the plants require attention.

Where the double window is a very wide one, it will be best to divide the front of it into three instead of two doors, making the middle a sliding door, and hinging the other two. It sometimes happens that the window is in a recess, or at the end of a projection of brickwork built out beyond the general face of the house. In such a case a glass partition, with a door in it, converts this recess into a conservatory

of a very convenient description, which can be decorated very ornamentally with growing plants.

In the same way a glass partition may be used to convert a bow-window into a receptacle for plants in pots, in which an invalid may find much amusement without being exposed to wind or weather.

The illustration at Fig. 21 shows a bow-shaped conservatory built against a large flat window, and projecting into a room. It need hardly be remarked that this could only be admissible in a room of large dimensions. A modification of this idea might, however, be conveniently designed for a vestibule, or inner porch of a front door, where there is plenty of light. In all these a variety of plants might be grown in a perfectly satisfactory manner; but without knowing the aspect and the amount of available light, it would be impossible to say what plants would do best.

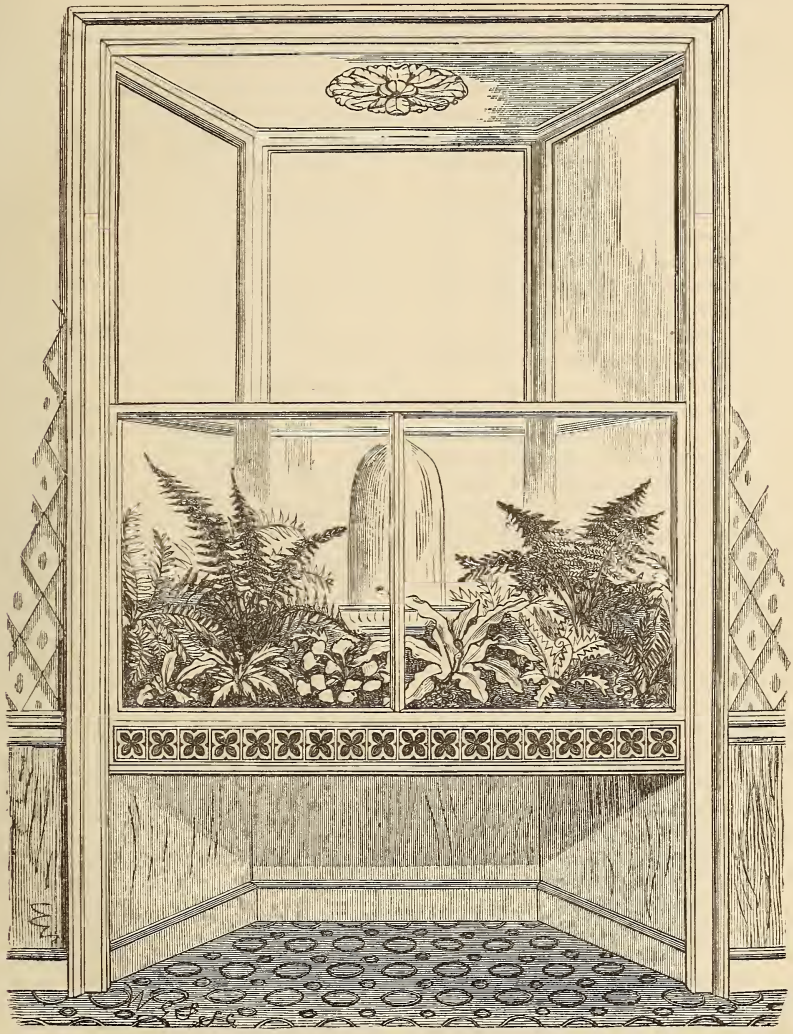


Fig. 22.—Double-sash Conservatory.

All the foregoing examples of in-door gardening under cover have been fixtures. We will now refer to some forms of movable cases, which will be of use to those who wish to do a little horticulture on

a smaller scale. First among these in usefulness and importance are Wardian cases.

Wardian Cases.—In the summer of 1829, Mr. N. B. Ward, of Wellclose Square, London, noticed a seedling of the common Male Fern and a seedling of one of the commonest British Grasses (*Poa annua*) growing on the surface of some moist mould in a large bottle. Curious to observe how vegetation would proceed in so confined a situation, he placed the bottle, loosely covered with a tin lid, outside one of his windows, with a northern aspect. This cover allowed a sufficient change of air for the preservation and development of the plants, and, at the same time, prevented the evaporation of the moisture within. These plants remained in the bottle for more than three years, during which time not one drop of water was given to them, nor was the cover removed. The Grass flowered the second year, but did not ripen its seeds. The Fern developed five or six fronds annually, but did not produce any fructification.

This led Mr. Ward to experiment on the growth of plants in closed cases, and to advocate the use of glazed boxes for bringing home plants from all parts of the world, and also for growing many kinds of plants in rooms, which could not otherwise be grown in such an atmosphere. Thus every description of closed glass case used for growing plants, from a simple bell-glass to the most elaborate miniature green-house, came to be designated a Wardian case.

This plan of cultivating plants in a room is naturally more suitable for Ferns and for plants grown for the beauty of their foliage than it is for flowering plants, since the latter require a drier air in which to display their beauty. The cheering influences of growing vegetation to an invalid are better known and more fully recognised of late years than they were formerly, and most physicians now admit the beneficial effects, especially in cases of mental depression or derangement.

It should, however, be understood that every Fern-case is not necessarily a Wardian case. The principal point in a Wardian case is, that it must be a *closed* case. It need not be hermetically sealed up, but it must be so far closed that the moisture which evaporates from the plants, and condenses on the sides of the case, must run down into the mould again and again. When the sun is allowed to shine upon such a case of plants, evaporation naturally takes place more rapidly than when the plants are in the shade. There is also more evaporation going on in a warm room than in a cold room. But, whatever may be the climate or the aspect of the room, the atmosphere in which the confined plants are growing must of necessity be a damp atmosphere. And further, it will be evident that the quantity of moisture in this atmosphere depends upon the wetness or dryness of the soil in which the plants are growing. This brings us to the conclusion that, while it is simple enough to have a very wet Wardian case, it is also practicable to have one in which there is very little moisture, and, consequently, that an immense variety of plants may be grown in different cases.

As Ferns are better subjects for imprisonment in glass cells than most plants, we deem it advisable to furnish a goodly list of species from which to select. In doing this we shall follow the advice given by the veteran ex-curator of Kew Gardens, Mr. John Smith, whose thorough acquaintance with the subject, both botanically and horticulturally, has rarely been equalled, and never surpassed. In his work "Ferns, British and Foreign," he gives a list of species suitable for Wardian cases of ordinary dimensions; but, inasmuch as the species are enumerated in their botanical sequence, it is very difficult for any one who is not an expert in pteridology to find out whether any particular Fern is or is not suitable for a Wardian case. The following alphabetical arrangement of his list will obviate this difficulty :—

Acrostichum auritum.
Acrostichum bifurcatum.
Acrostichum crinitum.
Acrostichum lepidotum.
Acrostichum peltatum.
Acrostichum quercifolium.
Adiantum æthiopicum.
*Adiantum affine.
*Adiantum Capillus-veneris
*Adiantum caudatum.
*Adiantum chilense.
Adiantum curvatum.
*Adiantum formosum.
Adiantum fovearum.
Adiantum fulvum.
*Adiantum hispidulum.
Adiantum lucidum.
*Adiantum macrophyllum.
Adiantum pulverulentum.
*Adiantum reniforme.
*Adiantum setulosum.
Adiantum sulphureum.
*Adiantum tenerum.
Adiantum villosum.
*Anemia adiantifolia.
Anemia fulva.
*Anemia Phyllitidis.
Anemia tomentosa.
Aspidium anomalum.
Aspidium falcatum.
Aspidium Lonchitis.
*Aspidium mucronatum.
*Aspidium triangulum.
*Asplenium alternans.
*Asplenium Belangeri.
*Asplenium brachypteron.
Asplenium braziliense.
*Asplenium erectum.
Asplenium firmum.
*Asplenium flabellifolium.
Asplenium fontanum.
Asplenium formosum.
Asplenium fragrans.
*Asplenium Hemionitis.
Asplenium macilentum.
*Asplenium marinum.
*Asplenium obtusatum.
Asplenium pinnatifidum.
Asplenium tenellum.
Asplenium viride.
*Asplenium viviparum.
Asplenium zeylanicum.
Blechnum campylotis.
Blechnum cognatum.
*Blechnum Lanceola.
*Blechnum longifolium.
*Blechnum occidentale.
Ceratopteris thalictroides.
*Cheilanthes alabamensis.
*Cheilanthes argentea.
*Cheilanthes capensis.
Cheilanthes elegans.
Cheilanthes farinosa.
*Cheilanthes fragrans.
Cheilanthes hirta.
Cheilanthes lendigera.
Cheilanthes microphylla.
Cheilanthes myriophylla.
Cheilanthes multifida.
Cheilanthes pedata.
Cheilanthes pulverlacea.
Cheilanthes radiata.
Cheilanthes tenuifolia.
Cheilanthes tomentosa.
Cheilanthes vestita.
*Cheilanthes viscosa.
*Davallia bullata.
*Davallia canariensis.
*Davallia chœrophylla.
Davallia cristata.
Davallia heterophylla.
Davallia hirsuta.
*Davallia pentaphylla.
Davallia pulchra.
*Davallia tenuifolia.
Doodia blechnoides.
*Doodia caudata.
Drymoglossum piloselloides.
*Fadyenia prolifera.
Gleichenia circinata.
Gleichenia dicarpa.
Gleichenia rupestris.
*Gymnogramme calomelanos.
Gymnogramme caudiformis.
*Gymnogramme chrysophylla.
Gymnogramme Martensii.

Gymnogramme peruviana.
Gymnogramme pulchella.
*Gymnogramme tomentosa.
*Hemionitis cordata.
*Hemionitis palmata.
*Hymenophyllum, all the species.
Hypoderris Brownii.
Llavea cordifolia.
*Lomaria lanceolata.
Lomaria L'Herminieri.
*Lomaria Patersoni.
*Lygodium palmatum.
*Meniscium simplex.
Mohria thurifraga.
Nephrodium æmulum.
Nephrodium albo-punctatum.
Nephrodium concinnum.
Nephrodium deparioides.
Nephrodium erythrosorum
*Nephrodium glabellum.
Nephrodium hirtum.
Nephrodium hispidum.
Nephrodium mexicanum.
*Nephrodium molle.
Nephrodium Pica.
Nephrodium podophyllum.
Nephrodium sanctum.
Nephrodium vestita.
Nothochlæna brachypus.
Nothochlæna flavens.
Nothochlæna Marantæ.
Nothochlæna nivea.
*Nothochlæna sinuata.
Nothochlæna sulphurea.
Nothochlæna trichomanoides.
*Onychium auratum.
*Onychium japonicum.
Pellæa atropurpurea.
Pellæa calomelanos.
Pellæa cordata.
*Pellæa geraniæfolia.
*Pellæa hastata.
Pellæa intramarginalis.
Pellæa ternifolia.
Platycerium alcicorne.
Pleopeltis nuda.
Polypodium angustatum.
Polypodium glaucum.
Polypodium incanum.
Polypodium juglandifolium.
Polypodium Lingua.
Polypodium longipes.
*Polypodium pectinatum.
Polypodium piloselloides.
Polypodium propinquum.
*Polypodium Schkuhrii.
Polypodium sepultum.
Polypodium serrulatum.
Polypodium squamatum.
Polypodium venustum.
Psomiocarpa apiifolia.
Pteris argyrea.
*Pteris crenata.
*Pteris cretica.
*Pteris denticulata.
*Pteris heterophylla.
*Pteris leptophylla.
*Pteris longifolia.
Pteris palmata.
Pteris pedata.
*Pteris sagittifolia.
*Pteris scaberula.
*Pteris semipinnata.
Pteris tricolor.
Scolopendrium rhizophyllum.
*Todea hymenophylloides.
*Trichomanes, all species.
Trichomanes spicatum.
Woodsia hyperborea.
Woodsia mollis.
*Woodsia polystichoides.

Those species marked with an asterisk are the sorts in this list recommended for Wardian cases by Mr. B. S. Williams, of Holloway, and are, therefore, more likely to be procurable from nurserymen than some of the others which are not so marked. The fern market, however, is subject to considerable vicissitudes, and the many recent changes in nomenclature have also had some effect in bringing certain varieties into more demand under their newer names. No doubt many of the Ferns here mentioned when fully grown are too large for ordinary cases; yet young plants of them are often amongst the most beautiful and suitable ferns that can be used.

Fig. 23 on the next page illustrates a Fern-case of simple construction. A shallow box or tray, made of stout wood, and well secured at the angles by dove-tailing, mitring, or angle-pieces, and with holes in the bottom for drainage, should be painted inside with three or four coats of paint, or with hot tar. The outside is ornamented with small branches of Hazel or Cherry, cut lengthways, and fastened on in patterns with small brads, or needle-points.

The panes of glass are first bound over their edges with stout paper, which is stuck on with thick arrowroot paste, or with weak glue, or size, in which a little coarse moist sugar has been dissolved. When this binding is perfectly dry, the panes of glass can be secured in position by gluing on strips of cloth outside, and by gluing strips of light wood, half an inch square, into the angles inside. A glass shade of this kind can be made very cheaply, and answers as well as more expensive ones for Ferns which do not require a very moist atmosphere to grow in. The species depicted in this engraving are all found growing in comparatively dry situations, and will, therefore, do well if they are merely protected from dust in a room.

Waltonian Cases.—If green vegetable matter of any kind is piled up into a heap, and allowed to decompose and rot, considerable heat is produced. It is from this cause that hay-stacks are so liable to be burnt when the grass is stacked before it has been dried sufficiently to have been converted into hay, or when the hay has been stacked in a damp condition. It is upon this principle that heaps of stable litter and manure are made up for growing Melons and Cucumbers, and for striking cuttings and sowing certain seeds which will not germinate without heat.

Now, although a window gardener is not likely to think of trying to grow Melons, he is nearly certain to wish to be able to raise some kinds of plants, either from seeds or cuttings, for which a little heat is indispensable, and he is equally certain to entertain a very strong objection to having a manure-heap in his parlour, no matter how small, or how well enclosed and boxed up that heap may be.

To meet this want, Mr. Walton designed a small box with a sloping glazed top to it, of the form which gardeners call a frame, but having for its bottom a shallow metal box, capable of holding water, under which the flame of a candle or lamp is placed to warm the water. Seeds and cuttings placed in a case of this description obtain a gentle heat, which starts some into growth when they would not otherwise grow at all, and expedites the growth of others for which heat is not absolutely necessary.

Such a case is, therefore, a great boon to every in-door cultivator. It is not an easy thing for an amateur to make unless he possesses all the tools and appliances for metal work, which few have. And if he is to pay for having this part of the case made for him he may as well, for a trifle more, buy the whole case complete, which he can get from Messrs. Barr & Son, King Street, Covent Garden.

If it were customary to keep sitting-rooms ten or fifteen degrees warmer, there would be many very ornamental Palms which might be cultivated, but which are now only seen in the stoves of the wealthy. Some of these may be grown in a

Waltonian case, and produce a charming effect, such as—

Acrocomia sclerocarpa.
Astrocaryum aureum.
Caryota sobolifera.
Caryota urens.
Chamædorea elegans. [gusti.
Chamædorea Ernesti Au-
Chamædorea gracilis.
Chamædorea graminifolia.
Chamædorea pygmæa.
Chrysalidocarpus lutescens (Hyophorbe indica).
Cocos plumosa.
Cocos comosa.
Cocos Weddeliana.
Dæmonorops plumosus.
Dictyosperma aureum (Areca aurea).
Dictyosperma rubrum (Areca rubra).
Euterpe edulis.
Œnocarpus minor.
Oreodoxa regia.
Phœnix farinifera.
Rhapis flabelliformis.
Rhopalostylis sapida (Areca sapida).

The cultivation of Palms is a very simple affair. The most important point is to keep them in a temperature suitable for each kind. Having associated together in one case some of the species which require the same average temperature, and taking care that they are not allowed to be in an atmosphere much colder or much hotter, the only other point to be attended to is watering. The soil which suits them best is loam, peat, leaf-mould, and sand, in about equal parts. The pots should be smaller than are generally used for other plants of a similar size, and there should be plenty of drainage. If the soil, the drainage, and the temperature are what they should be, they can hardly have too much water given them.

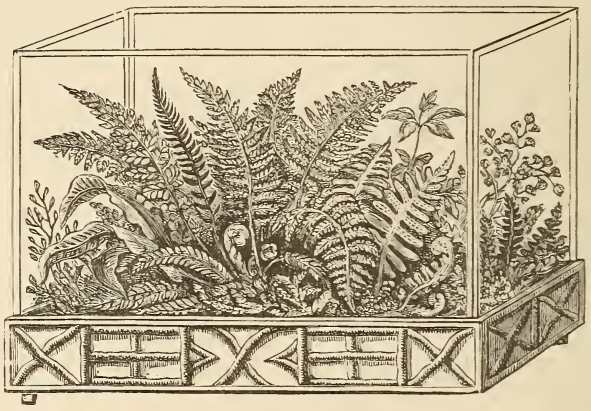


Fig. 23.—Wardian Case.

Aquaria.—There is no branch of horticulture so interesting as the cultivation of plants in water, partly because of the opportunity which it affords of seeing the growth of the roots of plants, which process is invisible ordinarily, but particularly on account of the great variety of both animal and vegetable life which can be kept in one pot or receptacle. The word "pot" is here used advisedly, since there is no better form of glass vessel for growing aquatics than a tall pot with straight sides, and of any convenient diameter. If it should appear desirable, for the sake of uniformity, that these vessels should be all of one size, a diameter of six inches will be found to be most generally useful. The height may vary from three inches to two feet, according to the habitat of the plants which are to be grown, for some are found in shallow, and others in deep water, but if uniformity in height is required in the glasses, twelve inches will be found a desirable height.

It is important that glass of good quality should be secured, as it is then so much easier to see what is going on. A very good make-shift is to be had by buying the show-glasses which confectioners use in their shop-windows, for holding sugar-plums and other "sweeties." If these are to be used care should be exercised, when purchasing them, to pick out those which have the fewest irregularities and flaws in the material, and to avoid, as far as possible, knots and air-bubbles. These are usually sold with glass covers, which fit into the top loosely. Do not discard these, for though they must not be used in the manner for which they were made, they will be useful in two other ways. By laying two thin strips of wood over the top of the vessel, and resting the cover on them, much dust will be kept away from the surface of the water while sufficient air will be admitted for the requirements of the growing plants. They can also be made available for the cultivation of minute plants, by inverting them and dropping the round knob or handle into a hole in a shelf or block of wood.

Having thus described the simplest form of aquaria, one might go on with an endless variety of designs that have been proposed and used for a similar purpose. After these plain receptacles for water-plants, the next best form is an inverted bell-glass, which can be bought of almost any size likely to be required in a room. These stand on a block of wood with a hole in the middle, into which the knob of the bell-glass drops.

The advantage of a bell-glass over a confectioner's jar is that it admits of plants of a larger size being grown; the drawback is that you cannot see so clearly what is going on in the centre of the aquarium, owing to the greater body of water that you have to look through.

The illustration in Fig. 24 shows a conservatory window, which has been fitted with an aquarium at the lower part of it. This should have three of its

sides slate and one plate-glass; and it should be so arranged that access can be readily had to the water, so that dead or dying animals or plants may be removed as soon as they are observed. The special cultivation of animals in conjunction with plants would, however, require a volume, and is foreign to the purpose of this work.

The following British Aquatics could be grown either in-doors or out of doors, provided that they are not exposed to frost. The Foreign Aquatics require a warmer temperature, especially during the winter:—

British Aquatics.

Alisma natans — floating, white. Autumn.
Alisma Plantago—1 ft. to 2 ft., pale rose. Summer.
Alisma ranunculoides—1 ft., rosy-white. Summer.
Butomus umbellatus—2 ft., rose. Summer. [June.
Carex sylvatica—1 ft. to 2 ft., brown.
Ceratophyllum demersum — floating, flowers minute. Summer.
Fontinalis antipyretica — under water. Moss.
Hottonia palustris — 1 ft., pale purple. June.
Hydrocharis Morsus-Ranæ—floating, white. Summer.
Iris fœtidissima—1 ft., violet-blue. Summer.
Iris Pseudacorus — 2 ft., yellow. Summer.
Isoetes lacustris — under water. Flowerless.
Limnanthemum peltatum (Villarsia nymphæoides)—floating, yellow. Summer.
Lobelia Dortmanna — ½ ft., pale blue. Summer.
Menyanthes trifoliata—1 ft., white. Early summer.
Myriophyllum spicatum — under water, flowers minute. Summer.
Myriophyllum verticillatum — under water, flowers minute. Summer.
Nuphar pumilum—floating, yellow. Summer.
Polygonum amphibium — floating, rose-red. Summer.
Potamogeton crispus — under water, flowers inconspicuous.
Ranunculus aquatilis—floating, white. Spring to autumn.
Sagittaria sagittifolia—1 ft., white. Summer and autumn.
Sparganium ramosum—2 ft., brown. Summer.
Stratiotes aloides — under water, white. Summer.

(See also Aquatic Plants.)

Foreign Aquatics.

Aponogeton distachyon — ½ ft., white. January to December.
Aponogeton minor — ½ ft., white. Jan. to December.
Calla palustris—½ ft., white. July.
Elodea canadensis (Anacharis Alsinastrum) — under water, flowers minute. August.
Hydropeltis purpurea—½ ft., red. July.
Hydrocleis Commersoni (Limnocharis Humboldtii) —1½ ft., yellow. May.
Jussiæa grandiflora—1½ ft., yellow. August.
Orontium aquaticum—½ ft., flowers scaly. June.
Pistia Stratiotes — ½ ft., white. June.
Pontederia cordata—2 ft., sky-blue. Summer.
Thalia dealbata—2 ft., blue. July.
Valisneria spiralis — under water and floating.
Villarsia ovata—½ ft., orange. June.
Villarsia reniformis—1 ft., yellow. July.

Fig. 24.—Aquarium in Window.

Marsh Plants.—There are many interesting plants to be found in boggy and marshy places which may be cultivated without much trouble. They should be potted, not in soil, but in moss; the best kind of moss for the purpose is Sphagnum, of which several species are to be found in bogs and wet localities. Growers of Orchids are well acquainted with it under the abbreviated name of Sphag.; but they use it in a damp condition, while for growing marsh plants we must keep it saturated with water, by standing the pots in saucers and keeping them well supplied.

As these plants are found in places where dust is an unknown material, it may be imagined that this is likely to prejudice their healthy growth to a serious extent if allowed to accumulate. It will, therefore, be desirable to wash this off every day with a watering-pot having a fine rose; but as prevention is better than cure, it will be the best plan to keep all such plants, when grown in a room, under a cover or shade, thus protecting them as much from the dry air as from the dust.

Marsh Plants.

Acorus gramineus — ½ ft., flowers scaly. February.
Caltha palustris—1 ft., golden-yellow. Spring.
Cardamine pratensis—1 ft., pink. April.
Cardamine trifolia—1½ ft., white. May.
Darlingtonia californica — 1½ ft., purple. September.
Davallia immersa — 2 ft. Fern.
Drosera filiformis — ¼ ft., purple. July.
Drosera rotundifolia—¼ ft., white. July.
Epilobium parviflorum — 2 ft., purple. July.
Eriophorum polystachyon—1 ft., white. Summer.
Galax aphylla—½ ft., white, July.
Helonias bullata — 1 ft., purple. April.
Hydrocotyle vulgaris—¼ ft., white. Summer.
Isolepis gracilis — 1½ ft. Grass. July.
Lysimachia Nummularia—¼ ft., yellow. June.
Myosotis palustris — 1 ft., blue. July.
Narthecium ossifragum — ½ ft., yellow. July.
Nephrodium Thelypteris—1 ft. Fern.
Parnassia palustris—½ ft., white. July.
Pinguicula vulgaris — ½ ft., violet. May to July.
Potentilla Comarum (Comarum palustre) — 2 ft., purple. June.
Ranunculus Ficaria—½ ft., yellow. May.
Sarracenia purpurea—½ ft., purple. June.
Saxifraga granulata — ½ ft., white. May.
Saxifraga Hirculus — ½ ft., yellow. August.
Saxifraga purpurascens — ½ ft., purple. May.
Spigelia marilandica—1 ft., red and yellow. Summer.
Spiræa Ulmaria—1 ft., white. Summer.
Trillium grandiflorum—1 ft., white. July. [May.
Viola palustris—¼ ft., blue.

Mosses.—If an indoor gardener wished to take up some unusual branch of horticulture he could not do

better than try his hand at the cultivation of Mosses. There are two ways of doing this: one is to collect the plants, the other is to sow the spores. In collecting the plants the principal points to be remembered are, not to disturb their roots, and not to bruise the plants in bringing them home. In sowing the spores care must be taken to deposit them upon the proper soil, whether it be clay, sand, chalk, limestone, or old brick from a wall. In both cases it is most important to arrange that they shall grow in an atmosphere as nearly as possible corresponding with that in which they grow naturally. This is doubtless difficult to do, but it can be done; and one great pleasure in growing them arises out of the ingenuity, care, and attention required to do it successfully.

The best mode of cultivation is to place a very small piece in a watch-glass, to place this on a saucer of dried Sphagnum, and to cover the watch-glass with a tumbler, the edges of which are to rest on the Sphagnum. This arrangement allows water to be put upon the Sphagnum in large or small quantities, or not at all, according as the species may require a dry, a damp, or a very wet atmosphere to grow in. Some kinds are too large to be grown in this way, except in the young state, and these must be cultivated in well-drained flower-pots.

As objects for the microscope, there are few more beautiful or more full of interest to the careful observer. Whether we examine the germination of the sporules, with their minute white rootlets, or the green filaments which later on cover the surface with a velvet coating, or the cells of the leaves of the fully-grown Moss, some of which have spiral fibres within them, or the fringe of teeth which surround the mouth of most of the seed-vessels, sometimes in a single row, sometimes in a double one, we cannot fail to be struck with the beauty of the objects, many of which can be seen with low powers of the microscope; nor can we help being interested in watching their growth and development.

The watch-glass method of cultivation will be found particularly convenient for microscopical examination, since each can so readily be moved on to the stage of the microscope, and returned to its domicile under the tumbler.

The following species have been under cultivation, and doubtless many more might be grown equally well. For the convenience of cultivators they are thrown into groups according to the material upon which they grow, and the degree of moisture which they require:—

Dry Soil.

Bartramia pomiformis.	Pottia truncata.
Pogonatum alpinum. ‡	Tortula subulata.
Polytrichum juniperinum.	Trichostomum homomallum.
Pottia cavifolia.	Weissia controversa.

The third, sixth, and seventh like a sandy soil.

Damp Soil.

Atrichum undulatum.	Physcomitrium ericetorum.
Didymodon rubellus.	Physcomitrium pyriforme.
Fissidens taxifolius.	

The second and third grow on clay.

Wet Soil.

Hookeria lucens.	Trichostomum tophaceum.
Hypnum cordifolium.	

Bogs.

Climacium dendroides.	Minium punctatum.

Dry Rocks and Walls.

Anomodon viticulosus.	Orthotrichum anomalum.
Bryum argenteum.	Orthotrichum Hutchinsiæ.
Eucalypta vulgaris.	Orthotrichum rupestre.
Grimmia leucophæa.	Racomitrium heterostichum
Hedwigia ciliata.	Schistidium apocarpum.
Hypnum cupressiforme.	Septobryum pyriforme.
Omalia trichomanoides.	

The last grows on sandstone.

Chalk.

Hypnum molluscum.	Tortula rigida.
Seligeria calcarea.	

Damp Rocks and Walls.

Andreæa rupestris.	Minium rostratum.
Hypnum plumosum.	

The last is found on sandstone.

Wet Rocks and Walls.

Anœctangium compactum.	Fissidens osmundoides.
Dicranium pellucidum.	Racomitrium aciculare.
Dicranium squarrosum.	

As there are about 576 different kinds of British Mosses, a wide field is here open for making a large collection, which will occupy but little room compared with that required for a collection of flowering plants or Ferns. (See also Mosses.)

In a similar way could be grown many kinds of

Liverworts.—These curious plants come between Mosses and Lichens in the vegetable kingdom. Amongst them are several species that may easily be cultivated.

The commonest form is *Marchantia polymorpha*, which occurs on wet stones and damp earth nearly everywhere, but especially in sandstone districts. Their green, cellular, fleshy fronds creep over the surface, much in the same way that Lichens grow. Rootlets are emitted from the lower surface of these leaf-like processes, from which rise up the spore-cases on stems about an inch and a half long. This and some other species will grow readily if kept damp.

The largest number of plants in this order belong to the genus *Jungermannia*. These may be recognised from their general resemblance to feathery Mosses, from which they differ in having club-shaped fruits, and leaves which are almost transparent. They are found growing amongst moss and grass in damp

places, some in bogs, some in woods on the bark of trees, some on damp walls, and on the sides of ditches. The fruits when ripe separate into four valves, and discharge spores and singular spiral filaments, which are beautiful microscopic objects. The varied form and structure of the leaves are also well worthy of examination. There would be no difficulty in growing many of these, or, at any rate, in keeping them alive for a long time. *Riccia fluitans* is an aquatic member of this order, and is a curious and interesting plant, which is easily kept in an aquarium.

These lower orders of plants deserve much more attention at the hands of in-door cultivators than they have hitherto received.

Lichens.—It will probably surprise some amateurs to learn that there are certain kinds of plants which can be grown on a window-sill, without pots, pans, or vessels of any kind. Yet this is quite true of many Lichens, especially of those which grow on stones and on wood in dry and exposed situations. These plants are of exceedingly slow growth, and many of them assume very various appearances and characters in their different stages. The cultivation of these lowest orders of vegetable life is no new idea; it was practised successfully thirty years ago in France, at the Jardin des Plantes in Paris; and to those who possess a microscope the structure and development of these singular plants will afford, in their examination, instruction and pleasure of no mean order. Those on the bark of living trees are not suitable for our present purpose; but so numerous are the species growing upon flint and other stones, upon rocks and dead wood, that a diligent collector will have no difficulty in furnishing all his window-sills with sticks and stones, and all his servants with wonder at "whatever good they things can be for." As there are about six hundred and fifty British species, there is plenty to occupy the attention of any one who cares to confine himself to this one group of plants.

Fungi.—As the classification of this large order of plants is so intricate that experts are not agreed upon some parts of it, it will be better for the majority if we suggest the simpler plan of dividing Fungi into two groups, large and minute, visible and not visible to the naked eye, microscopic and non-microscopic.

The visible or non-microscopic division may be separated into three groups, represented respectively by a Mushroom, a Puff-ball, and a Truffle. These we do not recommend for cultivation, unless perhaps some of the smallest of the Mushroom group, which occasionally come up in a Fern-case, or under a glass shade, and are usually smashed or rubbed off as soon as discovered. If allowed to grow, and watched attentively, they will prove to be full of interest, especially if the assistance of the microscope be invoked in the examination of the anatomy and physiology of these plants.

It is, however, with the minute or microscopic division of Fungi that the in-door cultivator will be most occupied. These are represented by smuts, mildews, and moulds. They are generally so small that a "forest" may be grown upon the size of a sixpence. Many of them are found growing in or upon living plants, while a large proportion are only found upon dead or decaying animal and vegetable substances. Their development and mode of fructification are subjects of the deepest interest, and require for their elucidation the most assiduous attention and the aid of the highest powers of the microscope. It would be almost impossible to search any damp locality without finding some kind of mould or mildew. If a small piece be carefully placed upon the middle of a microscopic slide (a piece of thin glass, three inches long, by one inch wide), and kept under a tumbler on a saucer-full of wet moss, it will keep and grow for a considerable time.

A very good plan is to cut circles out of a piece of cardboard with a punch, such as was used for cutting wads for shot-guns before cartridges and breech-loaders were invented. Then with a smaller punch cut a hole out of the middle of the circle; this will make a ring of cardboard, which should be stuck on to the middle of a slide, and varnished over. If a dozen or two of slides are prepared in this way, there is always one ready to receive a specimen of a minute Fungus when found. If deeper cells are wanted, several thicknesses of cardboard may be cemented together. Rings of india-rubber must not, on any account, be used for making cells. Glass cells, made by cutting short pieces off a thick tube, and grinding the surfaces, are very nice, and easily cleaned. The piece can be cemented to the slide with warm Canada balsam. With contrivances of this kind quite a large collection of microscopic Fungi might be grown under a Fern-shade in a sitting-room.

Algæ.—The fresh-water thread-like plants which come under this denomination are amongst the most beautiful of microscopic objects, and their life-history is a subject that will well repay attention.

Each species should be grown in a separate tube of glass, or tall narrow aquarium. A very small piece thrown into a vessel of rain or pond water will soon grow, provided that it is placed where the sun can reach it, for these minute plants will not grow without sun-light. No mud is necessary for their growth. The green slime often seen in puddles by the road-side is worth collecting and putting into water; a very small piece is sufficient, as it will soon grow.

Collectors of these Confervæ should be provided with a supply of wide-mouthed short glass tubes, having good corks, and some pill-boxes, the latter for dry objects; for Algæ are not all aquatic. The green dust which we find on trunks of trees, and on palings in winter, *Protococcus viridis*, belongs to this order of plants; it apparently consists of a collection of circular green cells, each separate from the other; and in this respect differs from most other Algæ, which are made up of cells joined end to end in a thread-like arrangement. Small patches of a dark green jelly-like substance may sometimes have been noticed upon rocks in wet localities, and upon damp gravel paths in early summer after rain. This is *Nostoc commune*, and under the microscope is found to be composed of threads of circular cells, with some solitary cells amongst them.

In *Batrachospermum moniliforme*, which is a dark brown mass of wavy jelly, found only in running water, the threads are composed of oval cells joined together by their longer diameters, and these threads are branching. It is called the Frog-spawn Conferva, and is one of the most beautiful objects that can be found for the microscope. It would be very interesting to try and grow this, but not easy to arrange for imitating its natural conditions. The green Confervæ consist of threads without branches, and they float in the water. Their threads are divided into compartments, some long, others short; in some species these divisions contain one or more cells, in others there is a spiral thread. We find the latter form in *Zygnema spiralis*, a bright green Conferva, which is found growing at the bottom of streams in spring, and in summer rises to the surface, and forms a scum.

Any one who would give the requisite time and attention to the growth of these very interesting plants, which are almost the lowest in the scale of the vegetable kingdom, would be amply rewarded for his trouble.

SMALL AND BUSH FRUITS.

By D. T. Fish, assisted by William Carmichael.

THE GOOSEBERRY.

THIS is, without doubt, the king of all the fruits of this character—the most luscious of all the Currant-worts. Whatever may be said of the juiciness and sweetness of Currants or Raspberries, yet there is a sparkling briskness and freshness, as well as sweetness, about the Gooseberry that far exceeds either of these. Most lovers of Gooseberries are, in fact, often heard affirming that they are second to no fruit that can be grown in our climate. Judging by the enormous quantities consumed by those that love Gooseberries, even this overstated merit may be held to be established. The plant being indigenous is, consequently, one of our hardiest fruits, and there are scarcely any portions of the country so ungenial in climate, and so poor in soil, as to refuse to grow Gooseberries. This, however, must not be understood to mean that any, even the poorest, soil is good enough to grow Gooseberries to perfection. On the contrary, as we shall see, none can be too good for this purpose. The same, however, can hardly be said of the climate. This may readily prove too hot and forcing for the bringing out of the full flavour of this specially hardy fruit. For the Gooseberry is one of those fruits that must not be hurried. The faster it is grown, the lower its quality. A mean temperature of 55° throughout its period of ripening seems to suit it best. Certain it is that the same Gooseberry from, say, Perthshire and Cornwall is wonderfully different, and the quality is all in favour of Scotland, and against the South of England. Possibly the excess of heat carries the conversion of the acid of the fruit into saccharine matter rather too far, thus going round or back towards acidity again. Be that as it may, there can be no doubt of the fact that the further north, in reason, the better and sweeter the Gooseberries, and *vice versâ*.

Next to an excess of heat, a scarcity of water is the most fatal to full flavour in the Gooseberry. Possibly the reduced rainfall in the South, as contrasted with the North, is at least full half the reason of the inferiority of the Gooseberies in the southern portions of the country. It has almost seemed at times as if the flavour of Gooseberries were washed rather than shined into them.

As regards the latter, many Gooseberries of the thinner-skinned varieties cannot bear much direct sunlight without serious injury. It scalds or burns them, and so lowers or ruins their flavour, and sets up incipient fermentation within the substances of the fruit; and hence the wisdom, especially in dry districts, such as East Anglia, of making the Gooseberry a sub-crop under Plum or Apple trees, or, where this is impracticable, growing it on north walls or borders. There are other advantages in choosing these aspects besides those of shade, coolness, and moisture. It keeps the Gooseberies back in the spring, and this often saves a crop. For hardy as the Gooseberry is in a dormant state, no sooner does it break into half-opened leaflets than the first frosts blacken the young fruit, and there is an end of the crop for that season. However, the shade must not be overdone. For example, though Gooseberries on north borders or walls may acquire the highest flavour, if fully exposed to the light, those overhung by Apple, Plum, or other trees, are frequently of very inferior quality.

Propagation.—There are four easy methods of propagation—by seeds, cuttings, layers, and suckers. The first is used for new varieties, the second is the usual mode, the third and fourth are easy and sure methods. Taking the last first, as all Gooseberries are grown on their own roots, of course each root-sucker sent forth is already a Gooseberry-bush, which only needs detaching to form an independent plant. Suckers, however, are not popular, and are not thought so fruitful as plants raised by other methods. And as it is bad form in culture to allow the development of suckers, this mode of propagation may be dismissed.

No plant roots from layers more readily than the Gooseberry. In most localities each branch that leans on the ground emits roots, and layers itself into an independent plant, and if about midsummer the tips of the shoots are inserted two inches in the soil, each will develop a great tuft of roots before the end of the season. In layers thus formed, of course the current of the sap is reversed; but this is not found to be of any moment or inconvenience in practice. The branches may also be layered as already pointed out for Roses.

Unless for new varieties, seeds are not resorted to as a means of propagation. They take about four years to come into bearing. The seeds should be sown in the open so soon as ripe, as they vegetate in less time when not over-dried. The next year they may be lined out into rows a foot apart, and nine inches asunder in the rows, and left in these till they are wanted for final planting.

But the orthodox mode of propagation is by cuttings, and the best time for inserting them is the latter end of October or beginning of November. Nice pieces of the current year's wood should be chosen, and if heeled off from older wood so much the better for the cutting. Reduce it to a length of from nine inches to a foot. Remove all the buds from the base upwards, leaving two or three on the top of the cutting. Insert with a spade, as described for Rose cuttings (Vol. I., p. 211), and at similar distances, and tramp them firmly in. The cuttings should not be more than from four to six inches deep in the ground. Some recommend longer cuttings, inserting them at greater depths; but this is injurious to the future growth of the plant.

Ninety-five per cent. of Gooseberry cuttings will grow, and they should be lined out to wider distances, two feet by one foot or more apart, the following autumn.

Planting.—As to soil, the Gooseberry is by no means particular. It mostly does well enough in old kitchen gardens, rich in humus, and full of manure. Its favourite soil, however, is a rich friable loam, deep and moist rather than dry, well enriched with farmyard manure. Anything like stagnant water, however, must be avoided, or the Gooseberries will soon manifest symptoms of jaundice—that is, the leaves and even young shoots will become yellow. The site should be cool, and in the south partially shaded. Gooseberries, however, must not be overhung by dense trees either in the south or the north. The farther north, the more open and exposed should the bushes be. The best time to plant is the end of October or beginning of November, for reasons already given under Planting of Apples. As to distance, the old orthodox distance of six feet by four for bushes and pyramids has hardly been bettered. Cordons on walls may be of all the various forms used for Apples and Pears, and may range from seven inches apart for single, to eighteen inches or two feet for double, and yet further distances for multiple, or upright U or other shaped cordons. (For mode of planting, &c., see Apples.)

In the final planting out of Gooseberries, great care should be taken to remove all buds from the roots or stems, as single-stemmed bushes are not only more fruitful, but far more effective than those with two or many stems. Gooseberries make very effective pyramids, and these on rich soil should not be planted closer than nine or twelve feet apart if they are meant to reach a height of from seven to ten feet. The distance, however, should vary with the quality of the soil; the richer, as a rule, the further apart; the poorer, the closer the plants should be placed together.

After planting, staking, mulching, and watering should the weather prove dry, should be promptly attended to, so as to allow the plants to start into growth at once. The plants should in no case be planted deeper than the earth-line indicating their first depth in the cutting state.

As the roots of the Gooseberry are numerous, care should be taken in planting not to huddle them together, but to distribute them regularly throughout the soil. The roots are also in an abnormally active state in winter, and should not be exposed to the air one moment longer than is needful. They should also be surfaced over with a frost and drought resisting mulch so soon as planted.

Pruning.—Volumes might be filled with what has been written on this subject; and the practice varies still more widely than the theories. One or two general principles may, however, be referred to. The first is, never prune a Gooseberry-bush or tree when it is planted. Let one pruning of all trees—at one time, whether of roots or tops—suffice. And this reminds us that the Gooseberry was systematically root-pruned before fruit-trees in general were

subject to this mode of culture. The older cultivators, who went in for monster Gooseberries, believed in keeping the roots at home by triennial or frequent root-pruning, and providing some rich food, such as night-soil, for them within a yard of the stems.

The practice was to bare the roots and note their character and ramifications. Those that had wandered too far, or dug down too deeply, were cut off, lifted up, or brought back within a distance of from one, two to three feet of the stem, and re-planted in fresh and rich composts. In addition to this, a trench, a foot or eighteen inches wide, and as much or more deep, was made all round the root-run of the bush, and this was filled with rich compost, and occasionally rank manures, such as cow-dung, night-soil, and even carrion, if any were available. Nothing was considered too rich or strong for the Gooseberries. No doubt, in this way, they suffered at times from an excess of manure; but when the composts were mixed with judgment and applied with skill, wonderfully fine growths and enormous Gooseberries frequently resulted.

Neither is the practice of applying carrion to fruit-trees and bushes yet abolished. Only last summer the writer was favoured with samples of some extraordinarily fine Apples from a farmer. On inquiry as to the cause of their unusual size, the answer was, "Everything that dies on the farm goes to the fruit-trees and bushes, and this tree had a dead horse cut up and buried round it two years ago." Without commending these practices, such facts may possess a special interest to some readers. If at a loss to dispose of a dead fowl, rat, or mice in quantity, the Gooseberry-bushes might grow finer berries were they to bury such small fry over their roots. Certain it is that the root-runs proper, and the trenches formed around them, were speedily filled with fresh roots in a few months after such root-liftings, prunings, and feedings as here described.

Another great advantage of these periodical prunings was that the cultivator always knew where to find his Gooseberry-roots, as they were seldom allowed to stray more than a yard or a trifle more from the stem. Hence, when special feedings or waterings were resorted to, it was easy to supply both food and drink in the right place, and so that the roots were sure to find it, and make the best of it at once.

As to other pruning, it necessarily has two objects in view—the formation of the bush, and the growth of the finest fruit. The first point is the height of stem. Most prefer from four to six inches of clear stem, some a foot or more as the least that should be allowed. On dwarf cuttings one leading shoot should be trained up the first season, to form the stem, which should be run up straight to the desired height. Pruned in the autumn, at least three buds should be left on its crown. These form the basis of the future bush, whether it is to be open-centred, a pyramid, standard, or what not. The shoots produced from these buds should be shortened back to about six inches next autumn, and from each of these a couple of shoots will be led the following season. These may be tied to a hoop, to keep the centre quite open, or mould it into the form of a vase. These leaders may be laid in at the rate of six or more inches a year, and other shoots may be taken from them to fill up the bushes as the area of the circle widens. All other shoots should be close-spurred in the autumn, that is, cut back to within an inch or an inch and a half of their base. In hot, dry localities, however, the spurs may be left longer, so as to provide more shade for the fruit. In these, too, the pyramidal is the better form for Gooseberries.

The formation of pyramidal Gooseberries proceeds on the same lines as that of Apples or Pears. A central leader is tied up to a stout stake and led up from the front. From this all the side shoots are led off horizontally or at an angle of wide divergence from it. The length of leader left, and the number of side shoots started from it in one year, must be largely determined by the vigour of the plants, and the quality of the soil. The lengths may vary from six inches to eighteen, and the number of shoots from three to six, nine, or even a dozen. On an average, a nine-inch length of leader, and from three to five side shoots, will enable the bush to make rapid progress without becoming bare or thin at any part. These formal pyramids also look most artistic when their base is lifted a foot or so off the ground. Pruned into this form at starting, and kept in good shape afterwards, Gooseberry pyramids are as artistic as they are prolific and satisfactory. There is, however, a much more free-and-easy method of moulding Gooseberry-bushes into rough pyramids. Several shoots may be led up from the root-stock, keeping one, however, well ahead of all the others for a centre. By pruning annually with a view to the maintenance of the pyramidal form, the shape may be preserved with a minimum of pruning, and an enormous yield of fruit. But this, as pruning necessarily does, leads us on to—

Training.—Now, as already stated, the Gooseberry may be moulded into all the forms assumed by other fruit-trees albeit in miniature. There is one very striking form seldom adopted, but one of the most beautiful of all, that is a dwarf standard, with the stem a yard or more high. This is a most useful form for town gardens, and is admirably adapted for such varieties as the Ironmonger and Warrington, that droop back to earth again, thus forming weep-

ing plants of great beauty, studded with their high-coloured, prettily formed fruit. Gooseberries confined to single stems—cordons, in fact—planted in rich deep soil, may be trained over arbouries, six feet high, and are admirable for the clothing of dwarf espalier rails and walls.

Cottages and outbuildings, wooden, wire, and other fences, also furnish excellent positions for the growth of Gooseberries, trained horizontally or vertically at from six to nine inches or a foot between the leading branches. Trained over such surfaces, carefully spurred and well fed, it is astonishing how long the Gooseberry will continue to clothe them with verdure and beauty, or cover them with plenty. Numbers of places, too small or cramped for an Apple, Pear, Cherry, or other fruit-tree, yet afford sufficient space for the growth of one, two, or several Gooseberry-bushes. In the case of cottage walls, a good plan of training can hardly be better described than that of cutting an ordinary and rather freely-grown Gooseberry-bush in two, and backing the divided lines against the walls. From this point almost any course of pruning and training may be adopted—that of close-pruning all the shoots but the leaders in the usual way, or that of merely thinning out the last year's shoots, and leaving many of them at full length, or a foot or more in length. These shoots will bear berries from base to summit the following season, and the yield is enormous. For, instead of a Gooseberry wall, there is a Gooseberry thicket extending a foot, eighteen inches, or even two feet or more from the wall, as the bushes acquire age. Carefully thinned and well fed, such bushes continue to thrive and produce enormous crops for years. Similar methods of free-and-easy training are often adopted on dwarf or other espaliers, the plants being permitted to broaden out a yard or so, instead of a mere double-faced line of fruit and foliage from four to six inches wide.

There is another method of pruning Gooseberries, which consists in giving them their heads one season, and pruning them back closely the next. In such cases it is wise to divide one's stock of bushes into two equal divisions. Leave the greater portion of the young wood, almost or altogether, full length; in fact, leave them wild one season. Should the spring prove genial, and the birds forbearing, the bushes will be covered with fruit from base to summit on the last year's wood. Early in October cut most of these shoots sharp back to within a bud or two of their base-buds. Next year they will yield a small crop of fruit on the old spurs, and a fine crop of young shoots. It is obvious that by having two sets of bushes, one making wood and the other producing heavy crops on that made the year before, and treating all alike in succession, abundant crops will always be forthcoming. Doubtless these and other free-and-easy methods tend to mar the perfect form of Gooseberry-bushes; but, after all, abundant produce is to be preferred to symmetry of form, and the biennial pruning instead of annual insures enormous crops.

Nor can our remarks on training be complete without reference to the use of the Gooseberry as a hedge plant for the formation of boundary lines around, and better still, dividing lines between, gardens. No one familiar with cottage gardens and allotments but must have regretted the loss of space and produce entailed by the too often prodigal use of White-thorn, Privet, Beech, Black-thorn, Maple, and other fences. Any of these or other hedge plants exhaust the soil as much and cumber it probably more than a hedge formed of Gooseberries. For forming hedges, the plants may be put in closely, a foot or so apart, and encouraged to grow into a wide base, tapering to a point at top. It is not needful even for defence, nor desirable for profit, that the Gooseberries should be so dense in their centres, nor so smooth on their sides, as hedges of White-thorns. But Gooseberry hedges a yard wide at the base, and varying in height from three feet to five, will form sufficiently safe dividing-lines between gardens. If planted in good soil a yard wide and deep, and the surface of the hedges left, say, six inches lower than the surrounding surface, and all house-slops, sewage, drainage of pig-stys, &c., applied to the Gooseberry-bushes during dry, hot weather, the plants would be maintained in vigour, and the crops developed into good size and high quality. In the case of dividing-lines, there might be a difficulty in fairly dividing the produce were each to claim his own side, and hence the fairness of measuring the hedges into two equal parts lengthways, each occupier to have the same length of hedge. A few stakes along the centre line suffice to start Gooseberry hedges straight and true, and the chief attention afterwards is to run the knife or shears over them in July, and again in October or November.

General Culture of the Gooseberry.—This consists in the prompt removal of suckers or misplaced shoots, in keeping the surface soil free of weeds, and liberally mulched with manure, in pointing or fleetly forking it up in the autumn, partially turning in the mulch, and adding fresh; in flooding the roots with sewage or manure, or clean water, in dry weather; in thinning the fruit, and carefully preserving it from the ravages of wasps and birds. The breast-wood should also be fore-shortened early in July, unless in hot, dry localities, when it is better left full length until the fruit is gathered. From three

to six buds should be left on the young wood, while the points of the shoots are thus removed. These can be cut back at the winter pruning to one or more buds.

Special Culture.—Few or no plants, fruit-trees or otherwise, have been subjected to more minute and special attention. So particular are the fanciers of big Gooseberries that almost every branch, leaf, and berry has had special and specific culture.

For example, those who insisted on perfect cup or vase-formed bushes spared no trouble or expense in obtaining the desired form by the use of a hoop two feet or a yard in diameter, placed round the branches a foot or so from the ground. But when these proved insufficient for their purpose, it was no uncommon thing for every leading shoot or important side shoot to be held in its exact position by two stakes: one a hooked stick or crome to keep the branch down, and the other a forked stick to keep it up, and hold it firmly in one position. In other cases, two or more hoops were used: one to tie all the leading shoots down to, and the others to hold or mould the sides into shape, and hold them fast until age and growth stiffened the boughs into rigidity.

Each branch was thus forced into and kept in what was considered the best place alike for effect and fruit-bearing; and any spray or leaf upon it that did not contribute to either result was at once removed. The berries were not only thinned with as much care and judgment as those of Grapes, but fed and stimulated with as much diligence and skill as live stock for show. The fruit, while fed through the roots by means of all sorts of solid and liquid manures, were also fed through their rinds as far as that was possible.

As to root-feeding, the following, among other means, are adopted. A mulch of fresh cow or pigeons' dung, several inches in thickness, is formed round the bushes, in the form of a basin, with its lowest point converging on the stem. This is finished with a smooth surface, and into this cup, formed of strong manure, there is poured daily in dry weather a gallon or so of pure or manure water, house-slops, or sewage. Another common method is to cover the entire surface under the bushes with strong and frequently-stirred farm-yard or other manure, and to sprinkle the surface of these with water at least twice a day, giving them in addition a thorough soaking of soot, guano, or other artificial or natural manure water once or twice a week.

Thinning, Weighting, and Suckling Individual Gooseberries. — In all cases where fruit of an ounce, ounce and a half, or more are desired, the fruit must be very severely thinned, leaving only one fruit where six or even a dozen might be grown. The best-shaped, stoutest-stemmed, best-placed berries should be selected, and these should be weighted by fixing small pieces of lead or stone, weighing half an ounce or more, to the corolla on the end of the berry. Thus selected and weighted to increase the sap-drawing and appropriating power of each berry, these may be yet further enlarged by a series of processes to which the general term of suckling has been applied with more or less appropriateness. They consist in keeping the fruit moist by capillary attraction, through winding one end of a woollen thread round the stem of each fruit, the other end being thrust into a bottle or basin of water; by placing open pans of pure or manure water beneath the bushes, and suspending small cups or saucers of the same beneath each fruit, as well as the use of rank manures and mulchings already described. The bushes are also sprinkled over-head two or three times a day. In a word, no labour, care, or skill is considered excessive that results in producing the monster Gooseberries, so often ridiculed, but which are really triumphs of skill and trophies of culture and perseverance.

Varieties.—These are very numerous, though of late years but few additions have been made to their numbers. Two causes have prevented many seedlings from being raised—one, that the varieties are already too numerous; and the other, that it is difficult, if not impossible, to better many of the existing sorts. Fortunately Mr. Carmichael assists us by his large experience to pick out the cream, though after his very best it may be allowable to have another dip into the wonderfully good new milk left.

Select List of Red Gooseberries.

Clayton — fruit large, and bears freely; a good variety.
Crown Bob—fruit large, of good flavour, and a great bearer.
Dan's Mistake — fruit medium size, handsome, bears freely, flavour good.
London — fruit very large, flavour good; a fine exhibition variety.
Speedwell—fruit large, flavour first-rate, and good bearer.
Talfourd — fruit large, flavour good; a fine late variety.

Select List of Yellow Gooseberries.

California—fruit large, flavour good, bears freely; a late variety.
Catherina—fruit large, flavour first-rate, and handsome fruit.
Leveller—fruit very large, one of the best Yellows, and good bearer.
Mount Pleasant — fruit large, bears freely, and very richly flavoured.
Trumpeter — fruit large, flavour good, and bears freely.

Select List of Green Gooseberries.

General—fruit large, bears freely; a good late variety.
Lofty — fruit large, very richly flavoured, and bears freely.
Matchless — fruit large, bears freely, and good flavour.
Thumper — fruit large, flavour good, and bears freely.

Select List of White Gooseberries.

Antagonist — fruit very large, one of the best for exhibition, and good bearer.
Bright Venus — fruit medium size, sugary, and rich flavour, and hangs till it shrivels; and good bearer.
Careless — fruit very large and handsome, flavour good; bears freely.
Freedom — fruit large, flavour good, and bears freely.
King of Trumps—fruit large, flavour good, and free bearer.
Lady Leicester—fruit large; a good early variety.
Whitesmith — fruit large; one of the best Whites, first-rate flavour.

Dessert Gooseberries.

Ironmonger—medium size, first-rate flavour, and bears freely.
Keen's Seedling — medium size, and of first-rate quality, and great bearer.
Pitmaston Greengage—fruit small, very sugary, and rich. It keeps well.
Red Champagne—fruit medium size, flavour very rich, tree erect, and a good bearer; a well-known variety.
Red Warrington — fruit above medium size; a first-rate variety, either for dessert or preserving, also one of the best keeping. It will hang on the tree if protected till the fruit shrivels.

Supplementary List of Gooseberries.

Red.

Overall.
Rifleman.
Roaring Lion.
Rough Red.
Slaughterman.
Wilmot's Early Red.

Yellow.

Broom Girl.
Conquering Hero.
Early Sulphur.
Golden Drop.
Yellow Champagne.
Yellow Smith.

Green.

Glenton Green.
Green London.
Matchless.
Rough Green.
Surprise.
Telegraph.

White.

Monster.
Queen of Trumps.
Snowball.
Snowdrop.
White Champagne.
White Lion.

Twenty-four of the Heaviest Gooseberries for Exhibition. — The following are among the heaviest Gooseberries ever grown:—

Monster Red Gooseberries.

Beauty	34 dwts.	Lion's Provider	30 dwts.
Clapton	32 ,,	London .	30 to 35 ,,
Conquering Hero .	30 ,,	Ploughman . .	30 ,,

Monster Green Gooseberries.

Green London .	27 dwts.	Shiner (the heaviest Green Gooseberry)	31 dwts.
Green Overall . .	27 ,,	Thumper . . .	30 ,,
Leader	25 ,,		
Stockwell . . .	30 ,,		

Monster Yellow Gooseberries.

Drill (probably the largest Gooseberry in cultivation, and of fair quality) .	32 dwts.	Catherina . . .	32 dwts.
		Leveller . . .	30 ,,
		Mount Pleasant .	31 ,,
		Pilot	30 ,,

Monster White Gooseberries.

Antagonist . . .	34 dwts.	Hero of the Nile .	28 dwts.
Careless	31 ,,	King of Trumps .	28 ,,
Freedom	29 ,,	Snowdrop . . .	34 ,,

The greater portion of these large sorts, if gathered in time, are capital for tarts or bottling, among the very best for the latter purpose being Cheshire Lass, Dan's Mistake, Queen of Trumps, Companion, and the Yellow Rumbullion, the latter being grown very extensively for this purpose, for which it is thought more suitable than the Green variety of the same name.

For converting into preserves, there are, perhaps, no better Gooseberries than the Rough Red and the Warrington, though the Yellow Globe and Sulphur are also largely used for this purpose.

In most of the very large varieties the percentage of juice to rind is too high for making a satisfactory jam, and Green and White are apt to prove wanting in colour, though, as to that, a good deal depends on the sugar and the making.

Cultivation in Pots and Tubs.—As the Gooseberry fruits freely in a small state, and may be grown for years without exceeding a yard in height or diameter, it readily yields to pot-culture. It is found in practice that a ten or twelve-inch pot, or a one or two-gallon cask, or old packing-box or basket, will grow Gooseberry bushes well, and not a few cottagers, who have little or no garden, have long practised this method of producing them, and some of the most fruitful and amazingly perfect Gooseberry bushes seen by the writer have been those of such fertile sorts as the Yellow Sulphur exhibited at flower shows in pots. Pot up the plants in October or November, using exactly the same soil or slightly richer than that recommended for the open air. Plunge the pots overhead, and mulch the surface of the pots with four inches of soil or manure for the winter. They may be placed where desired in yard, balcony, or on leads for the summer, and if the pots can be placed in others a size larger, should they have to stand in the sun, so much the better. In any case mulch the surface with cocoa-fibre refuse or moss if near to a living-room, with manure if not, to retain the moisture and preserve the roots cool. Gooseberries in pots must never once be permitted to flag for lack of water, and if specially fed and treated as advised for those in the open, they will yield good crops of excellent quality for many years in succession. They may also be grown in cool, shady back yards, or vacant spaces on the north and east sides of dwelling-houses, stables, or other buildings, where few other plants would thrive, and scarcely any fruits could ripen. One special caution must be given to those who attempt the culture of Gooseberries in novel forms and positions, and that is to beware of birds on the buds or at the fruit. Frequent sulphur, soot, or lime dustings, or one smear, will protect the former, and close netting the latter. Birds often seem to ignore fruit-buds or fruit in fresh places, but when they do espy them they mostly attack with such violence and force as to make a clearance in a very short time, the writer having once a dozen Peach-trees in tubs cleared of buds in about an hour;

and the birds are equally ravenous on sweet Gooseberry-bushes, either in bud or berry.

Diseases. — The Gooseberry on good soil is entirely exempt from disease of any sort. Unless the soil is too stiff or too wet, it continues in the most robust health for many years, being, in fact, one of our longest-lived fruit-bushes or trees. On such unfavourable soils as here indicated its leaves show, by their excess of yellow in the green, that the plants are declining in health, and the stems are apt to get cumbered with moss and lichens, which are injurious to the plants. The soil or site, or both, should be changed, and local remedies, such as smears of hot lime and soot, applied to the stems and branches, to clear them of moss and other incumbrances.

Insects.—These, from their number and voracity, furnish a sad per-contra and set-off against the immunity of the Gooseberry from disease. The worst of all is what is termed the Gooseberry Caterpillar—that is, the caterpillar of the *Phalæna vauaria*. In reality, however, there are, at least, three caterpillars that play sad havoc with the leaves of the Gooseberry. There are, in addition to the one just named, the caterpillar of the Magpie Moth (*Abraxus grossulariata*), and the larvæ of the Gooseberry and Currant Saw-fly (*Nematus Ribesii*). They vary considerably in size, colour, time of appearance, and mode of operation. But the net results of their attacks are very much the same—bushes wholly or partially defoliated, the leaves riddled in all directions, or the whole of them destroyed but the midribs, main nerves, or petioles. The first-named, or the last, is generally the first to appear, and this is followed by the caterpillar of the Magpie Moth, while the larva of the Gooseberry Saw-fly seems ubiquitous throughout the season.

Remedies.—The most efficient remedy consists in dealing with the insects in their pupa state. The pupæ of the Saw-fly especially are mostly deposited near the stem of the bushes, and may be destroyed by removing the soil to a depth of four inches all round them, and burning it, or burying it to the depth of two feet or a yard. A simpler method still is to dress the roots with a compost or mixture, consisting of cinder-ashes, lime, soil, and soot, about four inches deep, or, better still, spent tan, fresh out of the steep in the tannery. These two last either poison, or fix the pupæ or chrysalides in, so that death may make an end of them. Yet another mode consists in fixing them in by mere pressure—that is, firm treading with the feet, patting with the spade, or the use of a mallet or rammer.

Another series of remedies succeed in rendering the bushes so nauseous and distasteful to the moths, that they decline to lay their eggs or deposit their larvæ on the leaves. Powdered soot, sulphur, tobacco, salt, lime, guano, liquid manure, sewage, tobacco-water; poisonous powders, such as hellebore and sugar of lead, and preparations of nux vomica and arsenic, paraffin and other mineral oils, ammoniacal liquor, weak brine, and other substances, prevent the moths from converting the branches into breeding-grounds. So soon as the leaves that have been infested fall from the bushes, they should all be picked up and burned.

But the best remedy is really vigorous and persistent picking off of the caterpillars. By beginning so soon as the first appears, and keeping well ahead or on the heels of the different broods, it is astonishing how soon they may be picked off, and prevented from multiplying to any seriously destructive extent.

Wasps and birds are also at times most trying among the Gooseberries. Fortunately the former never touch them until the berries are almost overripe. When the finest varieties give out their vinous odours, the bushes not seldom become more like wasp-hives than honest Gooseberry-bushes. So attractive are the Gooseberries in that state, that it becomes dangerous to attempt to gather them for the excited and infuriated wasps. The only remedy is to destroy the wasps, or keep them out by the use of hexagon or other netting. But this is seldom effectual unless it is raised a foot or two above the bushes. Let it at any point touch the fruit, and the wasps, allured by the close proximity of the fruit, will quickly cut their way through the strongest netting, virtually sawing the textile fabric asunder with their sharp mandibles.

Wider meshes will exclude birds. But when about it, it is better to enclose a whole row or brake with wasp-proof as well as bird-proof muslin or other substances, for the wasps will skeletonise the fruit, leaving nothing but the skins, even faster than the birds can devour it, and they must be destroyed or kept out at all hazards. But the birds must be kept from the buds as well as the fruit, as otherwise the bullfinches, tom-tits, and other birds will make such raids on the sweet buds, that there will be few or no ripe berries for either wasps or birds or the cultivator in the autumn. There is no better means of saving the buds than several overhead soot-dustings after a shower, or on mornings when the bushes are heavily dewed over, with half-and-half of quicklime and soot.

Fortunately, too, a good proportion of the fruit is gathered before either birds or wasps care to eat it. The use of green Gooseberries, notwithstanding the enormous consumption of Rhubarb, is daily extending,

and probably a full half of all the Gooseberries grown are consumed or preserved in a green state. It is a good practice to thin these off the whole of the bushes when the crop is heavy, instead of, as is generally done, stripping a certain number of bushes for the supply of green, and leaving, as a rule, far too many on the bushes left to ripen. Some prefer the green fruit very small, as the larger they are the more acid. But if gathered before attaining a third or a fourth of their normal size, they are prone to prove about as insipid as a tart, pudding, or Gooseberry fool made of leaves or shoots only, were that possible.

The surest way to enjoy Gooseberries is to eat them off the bush, and if this is impracticable, then gather and serve directly, as few fruits suffer more, or more sudden deterioration, from being kept after gathering, than ripe Gooseberries.

HOT-HOUSE OR STOVE PLANTS.

By William Hugh Gower.

Ficus.—This family contains many handsome-leaved plants, and, commercially, it is a most important genus. From *F. Carica* comes the delicious fruit known as the Fig, a slight alteration from the Hebrew *feg*. Another species, *F. elasticus*, produces a very large quantity of "rubber," whilst *F. indica* is the famous Banyan Tree of India. The majority of the species have thick and leathery leaves, which renders them proof against the gas and changes of temperature in the dwelling-house, and thus, with Palms, they form beautiful objects for in-door decoration. They are all plants of easy culture; pot in a compost of about equal parts loam and peat, with a little sand added. Ficus grow more quickly in the stove, but thrive admirably in the Intermediate House.

F. dealbata—a slow-growing plant, with somewhat obovate-acuminate leaves; deep green above, snowy-white beneath. Upper Amazon.

F. elastica — the India-rubber Tree—is too well known to need a lengthy description; its large, dark green, shining leaves render it very ornamental in any position. East Indies.

F. exsculpta—a distinct and beautiful form, with elegant sinuate leaves, of a rich green. South Sea Islands.

F. Parcelli—leaves oblong-acuminate, thin in texture; the ground-colour light green, irregularly marbled with deep green and white. South Sea Islands.

F. religiosa—the "Pippul Tree;" this handsome species has bright green, nearly cordate leaves, which are lengthened out into long tail-like points; it is extremely ornamental. East Indies.

F. stipulata—this is an elegant little trailer, with dark green leaves about an inch long; it fixes itself to a wall or any similar object, and forms a beautiful screen; insects do not like it, so there is no trouble in keeping it clean. East Indies.

Fittonia.—A small family of Acanthads of prostrate habit, remarkable for the extreme beauty of their leaves. They are easily cultivated, their chief requirements being heat, moisture, and shade. Pot in loam and peat, with a little sand. Stove.

F. argyroneura — leaves nearly ovate, about four inches long; bright shining green, the whole of the veins being silvery-white. Peru.

F. gigantea—this species is more robust than the preceding, and produces leaves double the size; the ground-colour deep green, covered with a network of soft clear rose. South America.

F. Pearcei — leaves about four inches long; bright shining green; the veins all rich reddish-carmine, rendering it very attractive. South America.

Franciscea.—A handsome genus of *Scrophulariaceæ;* this must not be confounded with *Francisia*, which belongs to a very different order. These plants are free-growing, abundant bloomers, and also very fragrant. We have seen young plants of *Franciscea* grow and flower most abundantly when potted in leaf-mould only, but for large plants it is advisable to add a small portion of peat, loam, and sand. They are mostly spring or early summer flowers, and should be re-potted after the blooming season is past, and placed in a strong moist heat, stopping the shoots about every half-dozen joints made. About twice stopping in the season will suffice. When growth is finished the plants should be removed to the Intermediate House, and again brought into the stove as the flowers may be required. This genus is now named *Brunfelsia*.

F. calycina—leaves dark shining green; flowers in large trusses; purplish-lilac. Spring months. Brazil.

F. confertiflora—leaves deep green; flowers in terminal trusses; deep purple when first open, fading to soft blue and lilac with age. Spring and early summer. Brazil.

F. eximia—flowers not so large as calycina, measuring some two inches across; these are deep violet, changing to blue with age. Winter and spring months. Brazil.

F. Hopeana — sometimes called uniflora—a small-leaved species, with soft blue flowers, changing with age to pure white; it is a most useful plant for small stoves, as its fragrant flowers are produced in abundance during the mid-winter months. Rio Janeiro.

F. Lindeniana—flowers deep rich purple, with a distinct white eye. Spring months. Brazil.

Garcinia.—A genus belonging to the *Guttiferæ*. It contains many plants of commercial importance, and, as we shall not have occasion to refer to the order again, a passing notice may be given to some of them, especially as they are handsome-foliaged plants. *Garcinia Morella* is the producer of the best gamboge, which is also yielded by *Xanthochymus pictorius; Monorohea coccinea*, of Jamaica, produces a valuable gum; *Mammea americana* produces a fine dessert fruit, which is also preserved; *Pentadesma butyracea* is the Butter and Tallow Tree of Sierra Leone; the Mangosteen of the Indian Islands, *Garcinia Mangostana*, is the most delicious of Eastern fruits. This plant is a native of the Moluccas, and

has been introduced and cultivated in the Malay Archipelago, but all attempts to fruit it on the Continent of India have been futile, and yet in England it has been brought to yield its delicious fruit in perfection, which are about the size of a small Orange, and Chestnut-brown when ripe; the flavour is a compound of Melon, Pine-apple, Peach, and many other luscious and refreshing fruits, and it is perfectly wholesome.

G. Mangostana is a strong-growing plant, with opposite leaves about eight inches long; these are thick and coriaceous in texture and deep green; the leaves or stem, if bruised, yield a yellow gum, like gamboge. Pot in loam. Molucca Islands.

FICUS ELASTICA.

Gardenia.—These plants belong to the order *Rubiaceæ*, and are universal favourites, on account of the delicious fragrance of their flowers; popularly they are known as "Cape Jasmines," although really natives of China.

Gardenias enjoy an abundance of heat and moisture, and where practicable should be plunged in bottom heat, the old-fashioned dung-frame suiting them admirably; next to this the heat and moisture of the tropical stove is the best substitute. While growing they enjoy an abundance of water, both to the roots and over the foliage from the syringe; but they must not be sprinkled with water overhead when in bloom, or the delicate, pure white flowers soon stain and turn brown. During the growing season they must be shaded from the brightest sunshine, and, after growth is complete, removed to the Intermediate House for a short time, from whence they may be returned to the stove from time to time as they may be required, in order to keep a succession of bloom, instead of having them all at once; after blooming is over, if desirable, prune them, but as the plants are tolerably well cut back (especially when ladies gather the blooms) during the flowering season, and moreover, Gardenias seldom grow too large for the family requirements, it will be advisable to prune only just sufficiently to keep the plant in good form and properly balanced. Any re-potting or surfacing required should be done just as the growth begins, in order that the plants may reap the full benefit of the new soil. In the case of Gardenias planted out in a stove by themselves, the various changes of temperature can be obtained by lowering the fire-heat, and admission of more air. Gardenias when treated in this manner soon grow into large bushes, and yield a profusion of their choice flowers. Pot in equal parts of loam, peat, and well-decomposed manure, adding sufficient sand to make the whole feel gritty. There are other species of *Gardenia* besides those here described, belonging to a separate section, with mostly long tubular flowers, the best of which are *G. Stanleyana* (now *Randia maculata*), *G. octomera*, and *G. globosa*.

G. citriodora — somewhat slow-growing, produces flowers resembling in size those of the Orange, with a delicious fragrance. Winter. Brazil. (Correctly, Mitriostigma axillare.)

G. florida intermedia—leaves opposite, deep shining green above, paler below; flowers double and pure white, deliciously fragrant. Winter and spring months. China.

G. Fortunei—a strong-growing plant, resembling the preceding in general appearance, but twice as strong in growth, and the flowers double the size, with the same exquisite perfume. Winter and spring months. China.

G. radicans major—a dwarf compact-growing kind, with opposite, small, deep green leaves; flowers very freely produced, and like the others they are pure white and deliciously perfumed. Winter and spring months. China.

Gomphia.—A genus of *Ochnaceæ*, which are mostly shrubs or small trees, with simple alternate leaves, and producing very showy flowers. Pot in loam and peat, with a little sand. Stove.

G. olivaeformis (decora)—a very handsome, but little-known, flowering shrub, with alternate, broadly lanceolate, coriaceous, dark shining green leaves, and large terminal panicles of brilliant yellow flowers. Spring and summer months. Brazil.

G. Theophrasta — a bolder-growing species than the preceding; the terminal panicles are much branched, covered with large, rich, golden-yellow flowers. Spring and summer months. South America.

Gustavia.—A genus of noble flowering shrubs belonging to the order *Barringtoniaceæ*. They enjoy strong heat and moisture, and should be potted in two parts loam, one part peat, and one part leaf-mould. Stove.

G. gracillima—of this species its introducer says, "It is one of the grandest and most remarkable flowering plants of recent introduction." The leaves are linear-lanceolate, toothed at the edges and deep green; the flowers are produced from the axils of the leaves, composed of eight large petals, and measuring four inches across, the colour being a rich rose, the tube yellow, and the numerous anthers deep purple. Summer months. Columbia.

G. pterocarpa—leaves obovate acuminate, slightly toothed at the edges, deep green; flowers large and pure white. Summer months. French Guiana.

G. urceolata—Leaves obovate lanceolate and acuminate, deep green; flowers about six inches in diameter; petals creamy-white; the interior of the flowers suffused with rose; anthers yellow. Summer months. French Guiana.

MITRIOSTIGMA AXILLARE (GARDENIA CITRIODORA).

Guzmannia.—A small family of the Pine-apple order, requiring the same general treatment as *Æchmea*—which see (page 57, Vol. III.). Besides the one here described, other good kinds are *erythrolepis*, *grandis*, *Reginæ*, &c. Stove.

G. tricolor.—Leaves arranged in a rosulate manner, sheathing at the base, bright light green, the whole plant having a beautiful vase-like appearance; the spike rises from the centre of the plant a foot or more high; flowers pure white, enveloped in bracts, with scarlet apex, the lower ones pale green, streaked with purplish-black, and tipped with red. Summer months. West Indies, &c.

Heliconia.—These are extremely ornamental plants either in or out of flower; they belong to the order *Musaceæ*, and require considerable space to develop their beauties. Pot in loam, peat, and well-decomposed manure, in about equal parts, drain well, and water freely. Stove.

H. aureo-striata—having somewhat the habit of *Musa chinensis;* the broad leaves are deep green, transversely veined from midrib to margin with orange-yellow. South Sea Islands.

H. humilis.—Bold and handsome, the petioles and blade of the leaf reaching from four to six feet high; the blade, oblong-lanceolate and pale green, is about two feet long; the scape shorter than the petioles, and bearing numerous distichous boat-shaped bracts of a brilliant crimson-scarlet, which last for several weeks in full beauty; the flowers small, and hidden

in the bracts. Summer and autumn. French Guiana.

H. metallica—attains a height of about eight feet; blade of leaf about two feet long, oblong-acuminate, upper side deep satiny-green, beneath rich vinous-purple. The boat-shaped bracts are green; flowers large and showy, deep scarlet, tipped with white. Summer and autumn months. Santa Martha.

Hexacentris.—A small genus of evergreen climbing Acanthads of great beauty having much the appearance of, and now included under, the Thunbergias. Trained up a pillar or rafter, or upon an umbrella-shaped wire trellis, few plants can excel them in beauty. Pot in equal parts of light loam, leaf-mould, peat, and sand. These plants enjoy an abundance of heat and moisture when growing; during winter less of both will suffice.

H. mysorensis.—Racemes long and pendulous, flowers large, rich yellow, bordered with crimson. In the variety *lutea*, the flowers are wholly deep yellow. Summer months. East Indies.

Hibiscus.—A genus belonging to the Rose Mallow family, containing many species and varieties, remarkable for the extreme beauty of their large trumpet-shaped flowers; of vigorous constitution and rapid growth, they are very effective when used for covering a bare wall in a lean-to stove. Peat and loam in about equal parts.

H. Cooperii.—A somewhat small-growing plant, with both beautiful foliage and flowers; leaves deep green, flaked and striped with rosy-red and white; flowers carmine. Summer months. South Sea Islands.

H. rosa-sinensis.—This species and its varieties are widely distributed, being found in India, China, and through the islands of the South Seas; the flowers when bruised quickly turn black, and are used by the native ladies for dyeing their eyebrows, and also for polishing boots, hence it is frequently called the "Shoe-black Plant." Leaves bright shining green: it produces an abundance of its large trumpet-shaped flowers, which are of a brilliant scarlet; it is a very variable plant, hence some have double flowers, the colour being yellow, white, purple, &c. A few of the finest forms are: *brilliantissimus, fulgidus, Colerii, miniatus semiplenus, puniceus, vivicans, zebrinus;* they are almost perpetual bloomers.

Higginsia.—Handsome dwarf-growing plants, all natives of South America, belonging to the order *Rubiaceæ;* when first introduced they were known in gardens by the name of *Campylobotrys.* Flowers inconspicuous, foliage marvellously beautiful. Their dwarf habit should make them favourites with those having but small space. Pot in peat and sand, drain well, and keep the atmosphere well charged with moisture. Stove. (Now named *Hoffmannia.*)

H. argyroneura — leaves broadly spathulate, plaited; very deep green, with a metallic lustre; under side reddish-purple.

H. Ghiesbreghtii — this is perhaps the tallest species, but it can be easily kept down by judicious stopping; leaves broadly oblong; dark velvety-green on the upper side, purplish-red beneath. There is a variety called variegata, having the leaves flaked with creamy-white.

H. pyrophylla—leaves spathulate, plaited; deep green; the upper surface covered with short fiery-red hairs.

H. refulgens — leaves obovate; the upper side rich deep green, suffused with reddish-crimson, pale red beneath.

H. regalis—this is a very fine species; leaves roundish, ovate, and plaited; midrib white; ground-colour a deep rich olive-green, suffused with a beautiful grey and purple lustre; reverse side vinous-red.

H. smaragdina—leaves spathulate, plaited, and of a uniform, bright light green.

Holmskioldia.—A small family of *Verbenaceæ*, one species only of which we shall introduce here; it is easily grown into a good specimen. Pot in peat and loam. Intermediate House in winter, afterwards stove.

H. sanguinea.—A compact shrub with smooth, deep green, cordate leaves, crenate at the edges; it produces dense terminal racemes of bloom nearly a foot long, the flowers conspicuous, the calyx being large and deep blood-red in colour. Winter and spring months. East Indies.

Hoodia.—A small genus of *Asclepiadaceæ*, from South Africa; they have fleshy stems, with many angles, somewhat resembling the Columnar Cereus in habit, the angles furnished with long spines. This, and its kindred genera, have not flourished so well since the disuse of flues in favour of hot-water pipes, the drier heat of the former suiting succulents. Pot in loam, broken brick, and lime rubbish; water carefully through the growing season, but entirely withhold it in winter.

H. Bainii.—A most interesting plant. Stem erect, leafless, ribbed, the ribs being formed by rows of nipple-like tubercles, each of which when young is armed with a long deflexed spine, which falls off with age; flowers, two or three together, from near the top, campanulate, nearly three inches in diameter, with five small equidistant points on the edge; colour yellowish-buff, suffused with pink. Native name, "Wolves' n' Guaap." Summer months Karrao, South Africa.

H. Gordonii.—Stems clustered, tapering upwards, ribbed, leafless, profusely armed with stout yellow spines; flowers campanulate, with the edges reflexed, double the size of the preceding; soft lemon-colour suffused with pink, ornamented at the base with a circle of reddish-pink dots. South Africa.

Hoya.—These are handsome twining or creeping plants, belonging to the Swallow-wort family, *Asclepiadaceæ*, popularly known as Wax-flowers, from their thick wax-like blossoms, which are disposed in large umbels. Pot in peat and loam, adding a few nodules of charcoal, drain well, and allow them to have the full benefit of sun and light. Stove.

H. australis — an elegant climbing species, with orbicular leaves, and large simple umbels of waxy-white flowers, suffused with pink in the centre. Late summer and autumn. Queensland, &c.

H. bella—this is not a climber, but forms a beautiful pendent bush, and should be grown in a hanging basket; leaves small, flowers in axillary umbels; waxy-white, centre crimson. Summer. East Indies.

H. carnosa—the most popular of all the Wax-flowers; leaves deep green, fleshy; umbels many-flowered. These are very waxy in appearance, creamy-white suffused with pink. This climbing species may be grown in a green-house. Summer months. China.

H. coriacea—strong climber, umbels large; flowers yellowish-buff, the centre crimson. Summer. Java.

H. coronaria — a robust climber; producing umbels of very large flowers, which are pale yellow, the centre marked with fine bright red dots. Late summer and autumn. Java.

H. Cumingiana — a slender climber with closely-set leaves, umbels pendent; the flowers tawny-yellow, brownish-purple in the centre. Spring and summer. Borneo, &c.

H. imperialis—a very robust climber, and the largest-flowered species yet introduced; flowers waxy, reddish-brown. Summer months. Borneo.

H. ovalifolia — a climber; flowers large, yellow with a red centre. Summer months. East Indies.

H. Paxtonii — an elegant pendent basket plant, with umbels of pure white wax-like flowers with a pink centre. Summer months.

HOYA IMPERIALIS.

H. aristata.—A showy and much-branched shrub, some two or three feet high; leaves ovate-acute, and dark green; flowers in clusters from the axils of the leaves, and on the points of the lateral branches, rosy-purple, striped and spotted with purple and white. Winter months. Algoa Bay, South Africa.

H. sanguinolenta.—The leaves are highly ornamental, three to four inches long, about an inch and a half broad, deep green, the primary veins broadly banded with purplish-crimson; flowers on terminal spikes, rosy-purple and white. Winter months. Madagascar.

Impatiens.—A very large genus, containing nearly all the plants belonging to the order *Geraniaceæ*, *I. Balsamina*, the common garden Balsam, is a familiar example; these plants are remarkable for the force with which the valves of the seed-pods separate and throw the seeds to a great distance, and to which the only English species owes its name, *I. noli-me-tangere*, or "touch-me-not."

Impatiens are all soft-wooded, free in growth and abundant bloomers; they require to be frequently stopped to make bushy plants, and cuttings should be struck from time to time in order to maintain plants of a suitable size, when it becomes necessary to discard the old ones. Pot in a mixture of loam, leaf-mould, and rotten manure, drain well and water freely. Intermediate House.

I. flaccida—a free-growing compact plant, bearing a profusion of its large flat purple flowers, nearly all the year round; in the var. alba the flowers are pure white. Ceylon.

I. Hookeriana — a robust shrub, with pale green leaves and large white flowers, streaked with crimson. Winter months. Ceylon.

I. Jerdoniæ—stems short,

Hypoestes. — The following are all that are worth growing of this genus; they belong to the Acanthads, the name coming from *hypo*, "under," and *estes*, "covered." The fact of the bracts hiding the calyx probably suggested the name. The genus is closely allied to *Eranthemum* and *Justicia*. Intermediate House.

much swollen, and dark brown; the flowers are axillary and produced near the top, these are bright red and yellow, with a tinge of green, and very conspicuous. Very little water during winter. Summer months. East Indies.

I. repens—a trailing species with dark green leaves and bright yellow flowers. All the summer. Ceylon.

I. Sultanii—an elegant free-growing plant, with flat brilliant crimson flowers, produced in the greatest abundance all the season. There is also a white variety. Zanzibar.

Isolepis. — A large family belonging to the *Cyperaceæ*, said to contain about 200 species, the majority of which are not attractive. Propagated by division, growing alike freely in stove or warm green-house. The only one we here introduce, *I. gracilis*, is a pretty plant with deep green slender and pendent leaves; it is largely used for decorative purposes, for draping large pots, also as a basket plant.

Ixora.—This genus, which belongs to the order *Rubiaceæ*, ranks among the most gorgeous of stove shrubs. The name is said to come from *Iswarra*, the Hindoo god, large quantities of the flowers of *I. coccinea* being carried to the temples as an act of devotion. Many of the finest are species introduced from their native woods, while many others equally good, or better, are of garden origin, which are more hardy in constitution and require less heat. Ixoras may be said to resemble a Laurustinus somewhat in habit, with smaller opposite dark green leaves; the flowers are salver-shaped, that is, consist of a long slender tube and a flat-spreading limb, and are produced in large globose corymbs during the summer months. Pot in peat, drain well, supply liberally with water both to roots and foliage, and keep them in a high temperature.

I. amboynensis — corymbs very dense; flowers deep orange. Amboyna.

I. ambrosia—bright orange-salmon.

I. bella—light salmon-pink.

I. Chelsonii—bright orange-salmon, shaded with pink.

I. coccinea—intense bright red. Java.

I. Colei—corymbs very globose; pure white.

I. concinna—bright salmon, changing to salmon-pink.

I. decora—yellow, suffused with rosy-red.

I. Dixiana—a very deep orange.

I. Duchess of Teck—rich salmon, suffused with scarlet and violet.

I. javanica — soft delicate orange.

I. picturata — rich bright orange, changing to buff.

I. Pilgrimii—orange-scarlet, suffused with crimson.

I. salicifolia — a distinct plant with long and narrow Willow-like leaves; corymbs very large; clear bright orange-scarlet. Java.

I. splendida — rich orange-crimson.

I. Williamsii—corymbs very large; reddish-salmon.

Justicia. — A genus of soft-wooded plants belonging to the Acanthads; they produce showy flowers in terminal spikes. After flowering they should be cut back hard, in order to induce young growth low down, and thus prevent them having bare stems. For treatment see *Eranthemum*. Intermediate House.

J. carnea—stems swollen at the joints; leaves opposite, ovate-lanceolate acuminate, pale green; panicle terminal, dense; flowers soft flesh-colour. Winter and spring. Rio Janeiro.

J. coccinea — leaves elliptical; panicle terminal; flowers bright scarlet. Winter. South America.

J. flavicoma, correctly Schaueria calycotricha; flowers yellow. Summer months. Brazil.

J. speciosa—a fine species; tube of flowers very long, colour purple. Summer and autumn months. East Indies. Correct name, Peristrophe speciosa.

J. thyrsiflora—a handsome plant with brilliant scarlet flowers. Spring months. East Indies.

J. venusta — leaves ovate-acuminate; panicle large and dense; flowers rich purple. Spring months. East Indies.

Lasiandra.—A genus of Melastomads, of free growth and producing handsome flowers; these, however, are rather fugacious, and are not therefore useful for cutting, but as ornaments in the stove they are simply invaluable, the colour being a sort of deep mauve or purple, a desirable contrast. We introduce one species only in these pages. Pot in loam and peat in equal parts, adding a little sand. Intermediate House.

L. macrantha.—Truly a magnificent kind; the leaves are ribbed and entire, bright green; flowers produced in large panicles, each flower upwards of five inches across, and intense deep purple. Summer months. Brazil. (Now named *Pleroma macranthum.*)

Lemonia.—A small genus of Rue-worts; the species named *L. spectabilis* is now called *Ravenia*, and is a handsome shrub with ternate dark green leaves, producing from their axils numbers of beautiful rose-coloured flowers, which remain long in full beauty. Pot in loam and sandy peat, and place in the Temperate House. Autumn and winter. Cuba.

Lindenia.—A genus of Cinchonaceous plants, with somewhat the habit and appearance of Gardenias when not in flower, and thriving under the same treatment; they are destitute, however, of the delicious fragrance.

L. acutifolia.—The leaves oblong-lanceolate and acute, slightly tomentose, dull green; flowers axillary, tubular, pure white; tube slender, about four inches or more long; the limb flat and spreading, scarcely an inch across. Spring months. Vera Cruz, Mexico.

L. rivalis. — A larger plant than the preceding, leaves some three inches long, lanceolate acuminate, smooth, bright green above, paler below; flowers pure white, tube upwards of five inches long, limb one to two inches across, flat and spreading. Spring months. Guatemala and Mexico.

Linum.—A large genus of plants which give the name to the order *Linaceæ;* it contains many species that are showy border flowers; and *L. usitatissimum*, which is only known now as a cultivated plant, pro-

duces the flax of commerce. This plant must have been cultivated from the most remote times, for we read in Scripture that when Egypt was sorely troubled with its plagues, "the flax was smitten," and that "Joseph was clothed in fine linen;" whilst the mummy-cloths of ancient Egypt are found to be made from the fibre of this plant.

LINDENIA RIVALIS.

We have noticed the genus here, however, to introduce one species, *L. trigynum* (and not *tigrinum*, as it is too often erroneously named), which if pro-

perly grown forms one of the most valuable plants for winter decoration. It is not, however, really a Linum at all; its correct name being *Reinwardtia trigynum*. Start the plants early in the spring, grow on in an Intermediate House, stop the shoots often; keep the atmosphere well charged with moisture, as red spider is the great enemy of this plant. As the shorter days of autumn approach, remove them to a warmer house, when the flower-buds will soon appear and maintain a brilliant display through the whole winter. East Indies.

THE PEACH AND NECTARINE UNDER GLASS.

By William Coleman.

As these two fruits belong to the same genus, *Amygdalus Persica*, they are always classed and cultivated together; indeed, so close is the affinity, that it is not unusual for the Peach, which is the larger of the two and downy, to produce Nectarines, which are smaller, and have a smooth skin, and *vice versâ;* while sometimes the two fruits are found on the same shoot, and single fruits have been grown with the skin of the Peach on one side, and that of the Nectarine on the other. The late Mr. Thomas Rivers, of Sawbridgeworth, to whom we are indebted for so many fine varieties, succeeded in raising Peaches from Nectarines, and Nectarines from Peaches, amongst them being an excellent late variety called the "Nectarine Peach," as it is in every respect a fine, large Peach, with a smooth skin like that of a Nectarine.

It is generally supposed that this delicious fruit is a native of Persia, and that it was brought through Egypt into Greece and Italy, where it was pretty well known about the time of the Christian era. But some great authorities assert that it is a native of China, where it was well and extensively grown at least five hundred years before it was known in the South of Europe. In support of this supposition, they state that it is mentioned in the books of Confucius, and its great antiquity is proved by the fact that representations of its fruit are found on old Chinese porcelain and sculpture. From China they think it was taken to Cochin China and Japan, where it is still known by the Chinese name of *Too;* thence across the mountains through Cashmere, or Bokhara, into Persia, and eventually to Italy. Be this as it may, it is sufficient for the practical fruit-grower to know that it found its way, most likely, through France into England, about two hundred years ago, and that the pride and honour of breaking it up into numerous superior varieties, is due to men of our own generation and country.

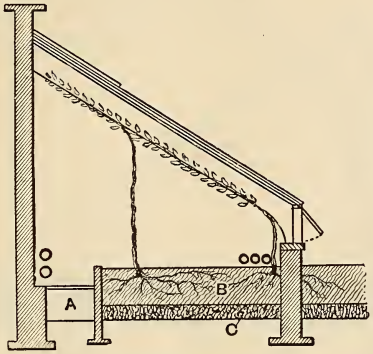
At the present time the Peach is extensively grown in Europe, Asia, and America, and also in South Australia. Under favourable conditions, it is frequently found to succeed in a low latitude; but being highly excitable, and always flowering in a low temperature, its deciduous nature does not fit it for a tropical climate. In the South of France, Italy, Australia, and America, it is grown in great abundance as a common standard or orchard tree, and produces excellent crops of fruit; but in our own country and the northern parts of France, it requires very careful management and training on a south wall to bring the fruit to maturity, and then the wood is frequently imperfectly ripened, and consequently gets killed during the following winter. In America, we learn that orchards containing thousands and tens of thousands of trees produce large crops of fruit, which is used for making Peach-brandy, and for drying as an important article of food, while tons of the fruit are conveyed to the large cities for consumption in a fresh state. The Americans raise their trees from stones, and, strange as it may appear, they do not live so long as worked trees in temperate Europe.

This may be due to the great extremes of heat and cold which they experience. but if there be any truth in the assertion that it is the pace that kills, it is more probable that the enormous crops they carry have much to do with this early collapse; certainly it cannot be imperfect maturation of the wood, as it goes through the sharpest winters with impunity, provided it is thoroughly ripened, as it must be in the United States.

When well grown, the Peach is one of the most delicious luxuries that can be placed upon the table. No good dessert from the end of May until the end of October is considered complete without it, and on this account there is always a great demand for fruit of superior quality. Unlike the Pine, Grape, or Melon, which can be grown abroad and brought to this country by tons and shiploads, the Peach must not only be grown in Great Britain, but it must be grown as British gardeners alone can grow it, to supply and satisfy the demand that has sprung up within the last few years. To meet this demand enormous span-roofed houses are erected, and very wisely too, by shrewd people who are aware that fresh Peaches from America are not likely to swamp their interests, and who, after hearing so much of the French Peach-trees, and the way in which they are trained, have found, upon inspection, that they have nothing to fear from that quarter, as the French are quite capable of consuming all their forced Peaches, which do not bear comparison with

our own. Then, again, the Peach is so tender, so easily injured when ripe, and so completely spoilt by the taint of a bruise going through it, as to render it very difficult for Continental packers to send it to this country in anything like satisfactory condition. The possession of a house full of ripe Peaches in May or June gives pleasure to the owner as well as the grower, and the maintenance of a continuous supply of this delicious fruit throughout the season, is one of the best tests of the horticulturist's skill as a cultivator of an Eastern fruit, and that during the worst months of the year, in a climate considerably too cold and treacherous for the hardiest native of the flowery land.

Fifty years ago it was not usual to find more than one Peach-house in a large establishment, and that heated by means of a flue, and strange as it may appear to the rising generation of gardeners, who now rarely see a flued house, excellent crops of fruit were produced in structures that were dark and heavy, but fairly ventilated, as every lap in the miniature-squared roof let in a small stream of air and kept the atmosphere of the interior in constant circulation. At that time, Royal George, Grosse Mignonne, and Noblesse Peaches were considered the earliest varieties for forcing. At the present time we have houses that are light, bright, perfectly ventilated, and efficiently heated with hot water, and it may be, ere long, thanks to Dr. Siemens, constantly lighted by means of electricity. Add to these advantages the command of such early kinds as Early Rivers, Early Louise, Early Beatrice, Early York, Early Grosse Mignonne, and Hale's Early Peaches; Lord Napier, Stanwick Elruge, and Early Orange Nectarines, all, with one exception, raised by the late Mr. Thomas Rivers, of Sawbridgeworth. Of more recent introduction, from America we have Amsden June, Waterloo, and Alexander, which ripen their fruit in an unheated orchard-house, early in July, and we have all the means for setting the elements at defiance, and the most suitable varieties for producing the finest and best Peaches and Nectarines that wealth can command. The means whereby the different varieties of Peaches and Nectarines can be distinguished have been already indicated in describing the Orchard-house treatment.



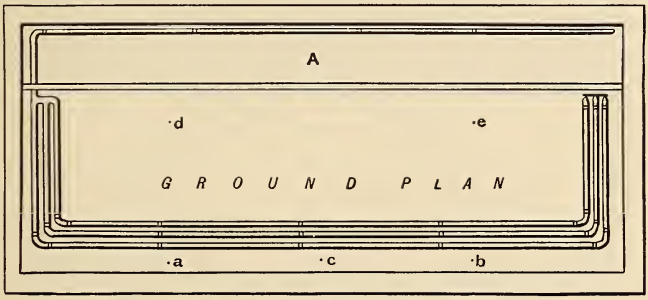


Fig. 1.—Lean-to House, with Parallel Trellis.
A, Area beneath path; B, border; C, drainage; oo, pipes; *a*, *b*, *c*, *d*, *e*, trees.

PEACH-HOUSES.

To have really good forced Peaches by the early part of May, which is quite as early as they can be had worth eating, under the best of management, and to keep up a continuous supply until the end of September, a set of houses, similar to those recommended for Vines, will be needed. These will consist of the ordinary lean-to facing the south, the span-roof running from north to south, and the Peach-case, which may be erected against existing trees on south or west walls.

For very early forcing, a sound, well-built, light lean-to—that is, a house built against a substantial brick wall — facing due south, is the best. A few points east or west do not make much difference; but as forcing has to be carried on in the dark winter months, shelter from the north and east should, if possible, be secured by planting evergreen trees behind, but not so close as to interfere with the light. If shelter of this kind cannot be obtained, the wall may be raised a few feet higher than the glass, and well coped with broad stones, sloping slightly to the north side, where a spout should be placed to catch the drip, and convey the water to the tanks. In old gardens, existing houses or ranges of houses, not always well placed, are divided into sections for giving a supply of fruit: but where they no longer answer the purpose, or new ones have to be built, the site should be well drained, elevated, and entirely open to the south, as light is

a very important item, not only in the production of firm, short-jointed wood, but also in laying on colour when the Peaches are taking their last swelling. In shape and construction, a range of lean-to houses need not differ from good Vineries, provided the pitch is sharp enough to carry off water freely, and prevent the lodgment of snow; but in order to rest the easily-excited occupants, and give the foliage, wood, and roots the full benefit of summer rains and refreshing dew, all early and mid-season houses should be built with sash and rafter, or portable roofs. It is now a very common practice to place closely-glazed, skeleton-looking, fixed roofs over Peaches from which ripe fruit is expected in May, or it may be June, and what is still less likely to happen, the foliage during the two succeeding months, which are generally very hot, is expected to resist the attacks of spider under bad syringing, or perhaps no syringing at all, and go through that period not only without injury, but absolutely performing its functions. To steer clear of the evils which follow roasting, when the trees, whose season has been reversed, ought to be resting, every light on early houses should slide up and down freely, and be easily removed when removal is considered necessary. Mid-season and late houses do not positively require stripping, consequently the cheaper fixed roof may be placed over the trees; but all forced Peach-trees are benefited by exposure to fine late summer and autumn rains, while very many are ruined by having the glass roofs kept over them, when they ought to be thrown open to the heavens.

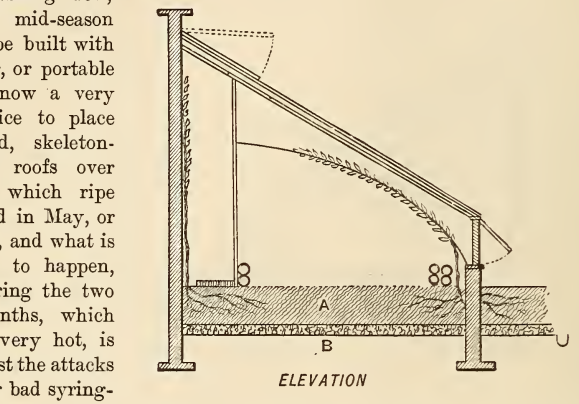


Fig. 2.—Lean-to House, with Curved Trellis.
A, Border; B, drainage; oo, pipes; *a*, *b*, *c*, *d*, *e*, trees.

The *horticulturist*, be he amateur or professional, will not assume that trees under all circumstances require stripping, even for a short period, as late houses have to be fired to get the wood ripe; but every man who is expected to produce a steady supply of fruit, five months in succession, should have every advantage placed at his disposal.

Size of House.—The size must, as a matter of course, be regulated by the demand for fruit, the number of varieties it may be thought desirable to grow, and the mode of training, as Peach-trees may be fruited in ten-inch pots, or they may be trained upon the extension principle to cover several hundred feet of trellis. For general purposes houses from thirty-six to forty feet in length, and fourteen to eighteen in width, are quite large enough; and where this size is not considered adequate to the demand, a longer structure, divided into sections, and separately heated, will be found preferable for giving a steady succession of fruit, as Peaches can be prevented from flowering until the end of March, but the fruit cannot be kept for any length of time after it is ripe. Where perhaps only one house is devoted to Peaches, the season may be greatly extended by the introduction of early, mid-season, and late sorts; but this is not an economical arrangement where very early fruit is wanted, as the late kinds have to be forced with the others, when they would come on and do better in what is termed a mid-season house. Therefore, to keep up a constant supply and avoid a glut, several compartments, planted with suitable varieties, will be found the best.

The front walls of all Peach-houses should be built upon arches, or better still, upon piers, to allow the roots the run of internal and external borders, although the latter are not often thought the best for early work. The trellises for training the trees

upon should be made of wire strained longitudinally, from six to nine inches apart, and from sixteen to eighteen inches from the glass, commencing at the base of the bottom light and running up to the back wall in medium-sized houses, which, as before explained, are the best for early forcing. In later, larger, and wider houses, they may be curvilinear as in Fig. 2, an arrangement which some think gives a variety of temperature and position to the trees, and consequently a better succession of fruit; but this is doubtful, as all the trees are further away from the glass, and in consequence not so favourably placed for ripening and colouring the fruit, without which good flavour cannot be expected. Then again, the lower half of the trees on the back wall being shaded, or altogether too far away from solar influence, the number of square feet fully exposed to the sun is only a trifle in excess of that obtained from the parallel trellis as in Fig. 1.

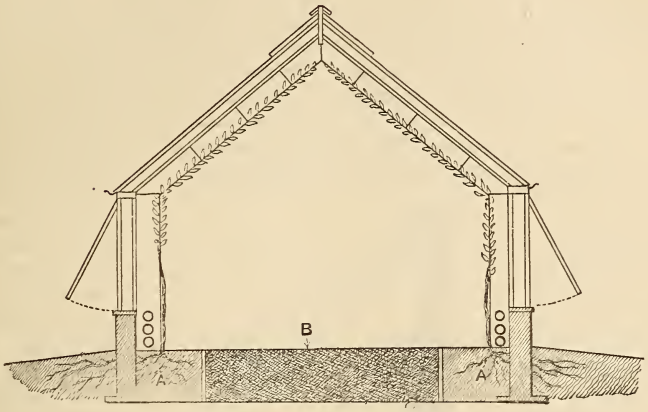


Fig. 3.—Span-roofed House.
A, Border; B, border covered with gravel; oo, pipes.

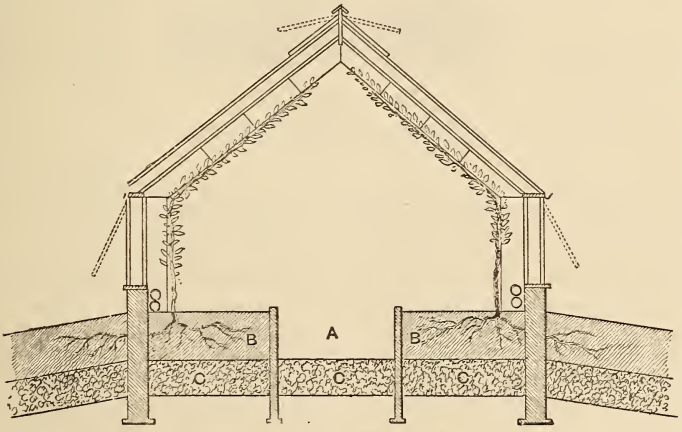


Fig. 4.—Span-roofed House.
A, Path; B, border; C, drainage; oo, pipes.

Heating.—Having in preceding papers directed attention to the importance of putting in good boilers and plenty of hot-water pipes, it is unnecessary to again revert to this subject except to state that the pipes should be placed near the front and back walls, and in sufficient quantity to keep up the necessary degree of heat, without, as a rule, making them very hot; and they should be plentifully furnished with evaporating-pans for throwing off atmospheric moisture from the time the houses are started until the fruit is nearly ripe. In the house (Fig. 1) where forcing is commenced in November or December, three four-inch pipes along the front, ends, and back will not be too many; while in Fig. 2, which is wider, four pipes along the front and ends, and two four feet from the back wall, will be sufficient.

The Span-roof (Fig. 3).—Although Peaches can be retarded through their early stages, in lean-to houses, so as to have them ripe in September, there are many situations in which the span-roof can be conveniently built for giving fruit through July, August, and September. Such houses should be erected with one end facing the north and the other the south, as the trees then get the morning sun on the east and the afternoon sun on the west side, while it is equally diffused over the whole of the house a little before and after it reaches the meridian. A house of this character was built at Eastnor some years ago as a winter store for Bays and Aloes, which are taken in after the fruit is gathered and removed about the time it is setting. The sides are perhaps a little higher than is necessary for Peaches

alone; but as there are very few places in which a house capable of doing double duty is objectionable, and tall standard trees can always be obtained, the extra cost is trifling if it is not money well invested. The trellis in this house is twenty inches from the glass, and the trees have the run of internal and external borders, and are trained upon the extension principle, never having been shortened back with the knife. The roof is fixed, but abundantly ventilated, and three rows of pipes for giving warmth and ripening the wood run along the two sides and the end facing the north.

Fig. 4 represents a very useful span-roofed house with raised borders, as well as the centre path, resting on eighteen inches of clean stone for the purpose of securing warmth and perfect drainage. The inside borders are kept up by four-and-a-half inch brick walls, and the whole structure is supported on brick piers fourteen inches by nine, placed four feet apart along the sides and ends. Although the internal borders are barely six feet in width, and the external roots are not numerous, the growth of the trees is all that can be desired, and the crops of fruit are excellent. It has often struck me that much expense and labour are wasted in making immense borders which the roots never fill; and that narrower, and consequently drier, borders, which will take frequent supplies of stimulating liquid, are better adapted for the growth of the Peach. When young trees are planted in borders of this kind, they at once set about forming and throwing out numerous bright fibry roots, similar to those we find in pots, and as these always ripen well, and are ever ready, with their thousands of healthy spongioles, for food in a liquid form, the growth they make is short-jointed, floriferous, and fruitful.

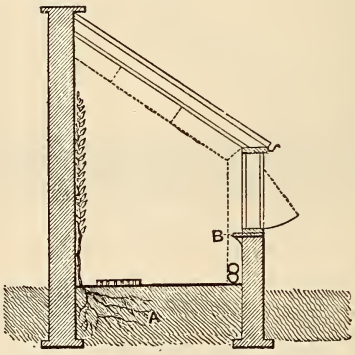


Fig. 5.—Peach-case.

A, Border; oo, pipes; B, shelf for Strawberries.

Peach-cases.—In addition to the lean-to and the span, there are Peach-cases, varying from four to eight feet in width, placed upon iron or brick pedestals sunk in the ground, not unfrequently in front of south walls already furnished with trees from which, owing to the unfavourable locality and the prevailing bad seasons, good crops in the open air are very precarious or uncertain.

Fig. 5 is a good representation of a Peach-case in which the trees can be planted against the wall, or they may be placed near the front, and trained over a trellis some sixteen inches from the glass as shown by the dotted lines in Fig. 5. Many of these cases are not fitted with hot-water pipes, but this is false economy, particularly in low damp situations subject to fogs in autumn, when the wood requires a dry, bracing, consolidating atmosphere, as well as in the spring, when sharp morning frosts, or the continuance of damp, dull weather, may be prejudicial to the setting of the fruit. Houses of this kind can be built with fixed roofs well ventilated at the top, and all the front lights should be made to open outwards by the aid of continuous ventilating machinery. They should also be fitted with hydrants for economising labour in washing the foliage and watering the roots, as the trees require an abundance of water. The main object being the certainty of securing good crops of fruit annually; and as late as possible, suitable kinds of trees, such as Walburton Late Admirable, Barrington, Sea Eagle, and Desse Tardive Peaches, Albert Victor and Victoria Nectarines, should be well represented. The ventilators should be thrown wide open and never closed through the summer, and a flow and return pipe should be laid on for use after the fruit is gathered.

Drainage for Borders.—Although the Peach delights in an abundance of water throughout the growing season, and casts its buds if allowed to get dry at the root during the winter months, it is greatly averse to cold stagnant water which cannot pass away through the drains. In some places, and especially in hilly districts on the granite, sandstone, and chalk, the natural drainage is quite satisfactory; while in others, where the subsoil is cold, wet, and heavy, it is necessary to make the most careful provision for the well-being of the roots, which should be as completely under control as those of the Vine. But as Peaches, in calcareous soils that suit them, do not require so much root-space as the Vine, the excavation for them need not be quite so wide, and the trees in early and mid-season houses should have the majority of the roots, if not all of them, inside. The excavation should, however, extend some little distance beyond the front piers, or arches, with a gentle fall from the back path to the barrel drain, as is shown in Fig. 1; while in the house represented in Fig. 2 the external excavation should not be less than six

feet, and the whole width of the interior, as the border for the trees against the back wall will be confined to the interior of the house. Having decided upon the level of the top of the border, it will be necessary to excavate three feet below the surface line, and put in the front drain running parallel with the house. Then the whole of the bottom must be covered with three inches of concrete beaten firm and trowelled over to make it smooth. When dry and hard it will be ready for the drainage, consisting of clean broken stones or brickbats, the largest pieces at the bottom, and the smallest on the surface to prevent the compost from being carried down when the fibre in the turf has decayed. Allowing a clear two feet for compost, the excavation will take nine inches of drainage all over the concrete; but as the piecemeal system of making the borders is the best, the drainage at the outset need not be wider than the first moiety of the border; say six feet inwards from the front piers for good trees that have been two or three years trained on preparatory walls, and four feet in width for younger trees direct from the nursery.

Compost.—The Peach and Nectarine, indeed all stone fruit-trees, succeed best in a rather strong calcareous soil, naturally sound, rich and sweet. In calcareous districts, where the Rose, Strawberry, and Oak flourish, a sound upland sheep-pasture will afford the main staple of the compost. This should be cut when dry from two to four inches in thickness, carted home, and thrown into a heap just before it is wanted for use. After it has lain for a few weeks, if time admits, chop it up roughly with spades, and again leave it lying in a long rough ridge to sweeten. If at hand, use tarpaulins for keeping out wet, but remove them on bright windy days and frosty nights. In the meantime prepare the corrective agents, which may consist of old plaster containing hair, old lime and brick rubble, burnt earth, scrapings from limestone roads, if dry—one or all, as may be most convenient. To every four cart-loads of loam add one load of these materials evenly all over the top of the heap, thoroughly mix by turning, and again protect from wet. When the time arrives for making the border, take thin sods of turf, place them grass side downwards all over the drainage, and keep a supply in reserve for building up the retaining wall as the material is wheeled in. As no manure will be needed, half a bushel of crushed bones and a peck of soot may be added to every load of the compost, the latter to free it from wire or other worms that may have been brought in from the pasture. The bone-dust is not, however, indispensable, as a sound compost like this will not unlikely force a stronger growth at first than is desirable. Having raised the border some four inches above the ultimate level, to allow for settling, ventilate the house, and prepare the trees for planting.

The compost here recommended, all other conditions being right, is not likely to disappoint; but there are hundreds of would-be Peach-growers who cannot get calcareous loam. They need not, however, despair, as other soils if fresh and sweet, including lighter sandy loams, or the edging from roads, will grow good Peaches, provided any stiff garden soil or marl be substituted for the burnt earth and road scrapings. Lime in some form being necessary, the rubble and crushed bones in this case will become essentials, and a mulch of thoroughly rotted cow-manure may be placed on the surface after the trees are planted.

In cold low-lying places, where the subsoil is difficult to drain, Peach borders should be partially or entirely raised above the ground-line (see Fig. 4) to allow the ingress of warmth and air, and the quick escape of water, as the roots never ripen in a cold saturated compost, but continue throwing crude matter into the trees when they should be at comparative rest. Trees under these conditions make gross watery growth, which rarely ripens to the point, and, the flower-buds being imperfectly formed, the fruit cannot set.

PROPAGATION, SELECTION, AND PLANTING.

Propagation.—Though the private fruit-grower does not often prepare his own stone-fruit trees, including the Peach, Plum, Apricot, and Cherry, he will find it greatly to his interest to select them for his own special purposes when they are ready to leave the nursery. When considerable distance divides the producer from the future grower, and he is unable to reach the nursery, he cannot do better than entrust his orders to a respectable firm as early as may be convenient, and leave the selection to the proprietor. Gardeners as a rule do not attempt the propagation, budding, and training of their young stocks, for the simple reason that it is a special and important branch of the nurseryman's business, which he can manage much better and cheaper than the grower; but this should not prevent every cultivator of fruit-trees from knowing how they are manufactured; therefore a few lines on this subject may not be out of place, the more so as Maidens, Dwarfs, Cordons, and Riders will henceforth be referred to in these pages.

Notwithstanding the fact that Peach-stones produce Nectarines, and Nectarine-stones produce Peaches, early varieties produce late varieties, and *vice versâ*, all the members of this extraordinary family do not succeed alike well when budded on one kind of stock.

The stocks generally used for the Peach and

Nectarine are the Brompton or Mignonne and the Mussell Plum. These are raised by layering the growths from established stoles in the nursery; when rooted they are detached, trimmed, and shortened back to the height of twenty to thirty inches, and planted out in lines to make a year's growth; the following autumn they are taken up, divided into two sizes, and again planted in rows three feet apart, where they remain until after they are worked. During the following July and August all that are growing kindly are budded with the approved kinds of Peaches and Nectarines, the buds remaining dormant until the following spring, when they start into growth. (Shield-budding, the mode generally practised in the working of stone-fruit trees, has been fully described and illustrated under Roses and elsewhere.) The stocks are then cut back to the bud, as at *a*, and the summer's growth results in the production of a "Dwarf Maiden" (Fig. 6), varying from two to four feet in height. In this form many growers, who object to cutting back to four buds, prefer buying and taking them under their own management. Early in the autumn the maidens are lifted, root-pruned, and planted out on well-prepared quarters, in rows four feet apart and two feet from each other; here they remain intact until the following spring, and when all danger of severe frost has passed away, the first barbarous act, that of cutting them back as shown to within four or five buds of the working, is committed, the object being the production of an evenly-balanced growth of a leader and two side shoots. Disbudding, stopping, and training result in a "one-year trained tree" with three shoots (Fig. 7). Cutting back is again deferred until the spring, when each shoot, in continuance of a barbarous custom, is shortened to within a few inches of its base. By three strokes of the knife each shoot is maimed, and the foundation of gumming and premature decay is laid; but the operation leads to the formation of a pleasing-looking tree with ten to twelve shoots, something like the annexed sketch (Fig. 8), and the nursery trainer's work is at an end.

Fig. 6.—Dwarf Maiden.

Standard trees are made in the following way:—When the time arrives for budding, the young stocks intended for double working are budded close to the ground with a free-growing plum; the bud remains dormant until the spring, when the stock is cut back to the working. During the summer this bud from the base throws up one strong straight shoot, which is worked with a Peach or Nectarine at the required height about the following August. When the leaves fall many of these trees are transferred to walls or fences for future training: some into half-standards, and others into full standards, ranging from two to six feet in height. To the uninitiated this double budding may seem unnecessary; but it is an authenticated fact that the process results in the production of a finer and quicker growth, and the plum being hardier than the Peach, it is better suited to the vicissitudes of our climate, while trees so worked are rendered more fruitful when they come into bearing.

Referring to a letter from the late lamented Mr. Robert Osborne, he says: "We use the Mussell for most kinds, but find some succeed better on the Brompton. Amongst these are your famous Abec, also Bellegarde, Belle Beauce, Chancellor, Grosse Mignonne, Malta, Royal Kensington, Royal Charlotte, and Stirling Castle Peaches; Balgowan Impératrice and Victoria Nectarines. The following are best on the Mussell Plum: Barrington Late Admirable, Noblesse, Royal George, and Violette Hative Peaches; Elruge, Hunt's Tawny, Pitmaston Orange, Red Roman, and Violette Hative Nectarines." To many

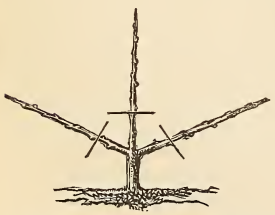


Fig. 7.—One-year Trained Tree.

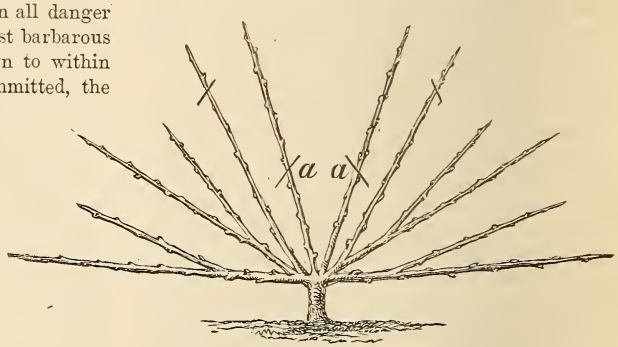


Fig. 8.—Nursery Trained Tree.

this information may not be new; to the amateur it may be interesting and useful, as it will enable him to choose or reject trees which have not been worked in accordance with the experience of a member of one of the oldest and most honourable firms in this country.

Selection.—The month of October is the best time to visit a fruit-tree nursery, just as the trees are finishing their growth, and before many, if any, have been taken away. In selecting choose trees with from eight to twelve evenly-balanced, moderately strong, well-ripened shoots. Even numbers are best, as vertical leaders are then avoided in future training. See that the union is neat, sound, and perfect, and the stem clean, healthy, and free from bruises or wounds, which may result in gumming. If for open walls, give preference to short double-worked half or quarter-standards, as they are hardier than dwarfs, and better suited for cold damp situations. For planting Peach-houses, dwarfs are as well adapted as quarter-standards, but for all general purposes the latter are to be preferred.

EARLY.

Peaches.	*Nectarines.*
Abec.	Hunt's Tawny.
Alexandra Noblesse.	Lord Napier.
Crimson Galande.	Murrey.
Dr. Hogg.	Rivers' Early Orange.
Early Grosse Mignonne.	Stanwick Elruge.
Hale's Early.	Violette Hative.
Large Early Mignonne.	
Waterloo.	

MID-SEASON.

Peaches.	*Nectarines.*
Bellegarde.	Elruge.
Dymond.	Hardwick Seedling.
Grosse Mignonne.	Lord Napier.
Royal George.	Pitmaston Orange.
Stirling Castle.	Stanwick Elruge.
Violette Hative.	Violette Hative.

LATE.

Peaches.	*Nectarines.*
Barrington.	Albert Victor.
Desse Tardive.	Dante.
Lord Palmerston.	Humboldt.
Nectarine Peach.	Pine Apple.
Prince of Wales.	Prince of Wales.
Raymackers.	Victoria.
Sea Eagle.	
Walburton, late Admirable.	

PEACHES AND NECTARINES FOR FLAVOUR.

Peaches.	*Nectarines.*
Abec.	Elruge.
Alexandra Noblesse.	Pine-apple.
Dymond.	Pitmaston Orange.
Grosse Mignonne.	Stanwick Elruge.
Royal George.	Victoria.
Violette Hative.	Violette Hative.

PEACHES AND NECTARINES GOOD FOR MARKET.

Peaches	*Nectarines.*
Abec.	Elruge.
Barrington.	Humboldt.
Bellegarde.	Lord Napier.
Crimson Galande.	Murrey.
Dr. Hogg.	Pine-apple.
Dymond.	Pitmaston Orange.
Hale's Early.	Stanwick Elruge.
Lord Palmerston.	Victoria.
Royal George.	Violette Hative.
Stirling Castle.	Walburton Late Admirable.
Violette Hative.	

Planting.—The borders in the different houses having been made and had time to settle, the planting of young trees direct from a nursery will be a very simple operation. But where the building of new or the re-planting of old Peach-houses has not been brought about by a hastily-conceived idea, the trees for this purpose should have been grown for two or three years against a reserve wall, where, by annual lifting, *not* pruning of the roots, they would be in a floriferous state, and ready to bear fruit the first season. The roots would be hard, fibry, and so numerous as to admit of removal at any time after the foliage begins to ripen, or before the blossoms open. Indeed, when well managed, it is no unusual thing to take trees from a wall to a house when in full flower, and gather a few dozens of good fruit the same season.

Assuming then that the houses as shown in the sections range about forty feet in length, three trees will be required for the front trellis, as is shown in the ground-plan (Fig. 1). Those at *a* and *b* must be dwarfs or half-standards, and the occupant of the centre, *c*, a full standard or "rider" to cover the upper part of the trellis, and give some fruit until the, permanent trees require the space. When the dwarf trees require more room, as they very soon will if trained on the extension principle, the "rider" will be cut away piecemeal, or lifted and re-planted elsewhere, as overcrowding in Peach-houses soon disorganises the management as well as the trees. Then with steel forks lift the trees, carefully preserving all the fibrous roots, which must not be allowed to get dry during the time they are out of the ground. With the same implements turn the surface soil off the borders at the different stations, place the trees in position, and sling the branches loosely to the trellis. Spread out the roots in every direction, cut the points off any that are unduly long, also any damaged pieces, otherwise if left they will only throw up suckers, and cover with a few inches of the compost. Work the soil well in amongst the roots with the hands, and when all are covered, give the whole area a few gallons of water through a rose to settle the soil about them. Defer putting on the remainder of the compost until after the newly-watered soil about the roots has become firm, then mulch with a little short manure and keep the house cool.

If the trees are planted direct from the nursery, the arrangement of the dwarfs will be the same as before; but the latter being small, two more "riders," *d* and *e*, may be put in to furnish the upper part of the trellis. In all cases avoid deep planting; four inches of soil above the roots is quite enough; also allow a space of six to nine inches between the trellis and the stems.

In the house, Fig. 2, three trees may be placed on

the saddle trellis (*a*, *b*, and *c*), the middle one (*c*) to be cut away as the trees at each end require space, and two "riders" (*d* and *e*) will be sufficient for the back wall. The span-roofed houses can be planted with half or full standards eighteen to twenty feet apart for permanent trees, and single cordons (Figs. 9 and 10), previously grown to a fruiting state, introduced between them, will give an immediate supply of Peaches until the others come into bearing. If cordons are not in favour, then some other kind of tree should be introduced as a supernumerary; their first cost is but trifling, and they soon give a return.

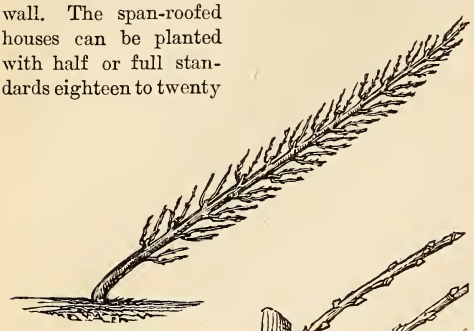


Fig. 9.—Single Cordon.

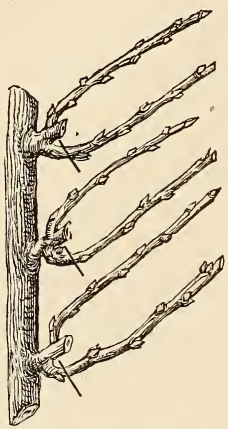


Fig. 10.—Branch of Fig. 9, Enlarged.

CHOICE HARDY BORDER PLANTS.

By Richard Dean.

Aconitum (*Monkshood*).—This is a very large genus of strong-growing perennials, varied in character, some of them having stout, erect stems five feet in height, while others are two feet or less, all bearing numerous helmet-shaped flowers, differing in colour; some are blue, others yellow, white, purple, &c. Many of them are exceedingly ornamental. They are, in the main, European plants, though a few have come from regions further remote. They are related to the Crowfoots (*Ranunculaceæ*).

The generic name—*Aconitum*—is said to be derived from Acona, the plant being plentiful about there. The English name Monkshood, which is more particularly applied to *Aconitum Napellus*, a plant found frequently in borders, is said to have been derived from the resemblance of the upper sepal to the cowl of a monk. But it has another English name, viz., Wolf's-bane. This is of great antiquity. The true Wolf's-bane is *A. lycoctonum*, a Japanese plant, and a noble late-flowering perennial, blooming in autumn, of a pale creamy-yellow colour, and growing to a height of three and a half feet. It does best when planted in the borders of shrubberies and naturalised in woods in semi-wild places. Wolf's-bane means Wolf's-poison, so called because, says Gerarde, "the hunters which seeke after woolfes put the juice thereof into rawe flesh, which the woolfes devour, and are killed." In Sweden, a decoction or powder of the root of this plant is used for destroying flies and other insects. In his book on "Plant Lore, Legends, and Lyrics," Mr. R. Folkard states that "by the ancients (who were unacquainted with mineral poisons) the Aconite was regarded as the most virulent of all poisons, and their mythologists declare it to be the invention of Hecate, who caused the plant to spring from the foam of the many-headed Cerberus, when Hercules dragged him from the gloomy regions of Pluto." With this venomous plant the ancients were wont to poison their arrow-heads when engaged in war, and also in pursuit of wild beasts. Ovid was of opinion that the *Aconitum* derived its name from growing on rocks almost barren. In Greece the Wolf's-bane is credited with many malignant influences, and the fevers so common in the neighbourhood of Corinth were attributed to it. Until the Turks were dispossessed, the aga proceeded every year in solemn procession to denounce it and hand it over to destruction. A species named *A. ferox*, which grows in North India, is used as a poison for arrows, the poison which is obtained from the roots being of remarkable virulence and activity when infused into the blood.

It is necessary to name only a select few of the Aconitums as worthy the attention of the amateur gardener. They are—*A. autumnale*, from Southern Europe; height three and a half feet, the flowers pale blue, tinged with lilac, produced in August and on to November; it does well on the fringe of a shrubbery border, in light garden soil. This is the Autumn-flowered Monkshood. *A. chinense* is a native of China, a large and stately species, height four feet to six feet, flowers bright blue, produced in large compound racemes, in summer; should be planted on a warm border, in sandy loam. *A. japonicum* is the Japanese Monkshood, a noble-flowering late species, being from two and a half feet to three feet in height; flowers produced in autumn, large, deep blue or lilac; and it does well in borders, and here and there among low shrubs in fine, deep, sandy

soil, or in peat. *A. Napellus*, the Common Monkshood, is one of the very best, growing three feet in height; flowers dark blue, produced in summer, and doing well on ordinary borders. But it is such a frightfully poisonous plant that many will not grow it, preferring to destroy it, and one authority states it should never be grown in a vegetable garden. The juice of the leaves and the root are both highly injurious, and it is stated that instances are known where persons, having taken the effluvia of the plant in full flower by the nostrils, have been seized with swooning fits, and lost their sight for three or four days. Cases are mentioned where deaths have ensued owing to the root of the plant being used under the impression it was Horse-radish. *A. paniculatum* is the Panicled Monkshood, a tall and handsome kind, four feet in height, flowers blue and white, produced in late summer; does best in a peaty soil. *A. variegatum* is the Variegated-flowered Monkshood, a stately plant, four feet in height; flowers sky-blue, variegated with white. While this does well in any garden soil, it is also useful for forcing, and, like most of the Monkshoods, can be readily increased by division of the roots.

Ajuga (*the Common Bugle*).—Whence the generic name of this plant was derived is uncertain, but it is said, not improbably, from *ad* and *juga*, to yoke or unite together, for of its healing properties it was said: "Beyond sea in France and Germany, it is a common proverbe that they neede neither physician to cure their inward diseases, nor chirurgion to helpe them of any wound or sore, that have this Bugle at hand by them for use." This was said of the Common Bugle, *Ajuga reptans*. The English name Bugle is of very uncertain origin; it may be from the Latin *bucco*, "wide-mouthed," which is a character of the flowers. *Bugula* was the generic name of these plants used by all the old herbalists, and is regarded as a diminutive of *abuga*, one of the various spellings of a word given by Pliny as corresponding to a Greek word variously written as *abiga*, *ajuga*, *iva*, &c. *Ajuga reptans* is a common plant known everywhere in Britain; plentiful in fields; flowers blue, rarely white; produced all the summer in whorls in the axils of the leaves, on erect stems. There is a variety of this with claret-coloured leaves that is often employed as a very useful edging plant in the flower garden. Then there is a fine variety called *purpurea*, with larger and deeper-coloured purple blossoms. *A. alpina* is the Alpine Bugle, with pale blue flowers; it is found on mountains and pastures in wet situations, and is rare. There has recently been introduced to English gardens a very fine variety of this, known as *A. alpina Brockbanki*, a new and very desirable flowering plant, having deep blue flowers, and dark claret-coloured foliage. *A. genevensis* is the Geneva Bugle; a dwarf, hairy perennial, flowers blue; produced in summer, in whorls forming handsome spikes. *A. pyramidalis* is very nearly allied to this. The former produces erect spikes of the deepest blue, and has a compact habit of growth. The Ajugas are easily grown in any ordinary soil, and quickly increased by division.

Anchusa, or *Bugloss.*—The Anchusas are all hardy plants, and comprehend annuals, biennials, and perennials. The generic name is supposed to be derived from the Greek *anchousa*, a cosmetic and paint obtained from the root of the Alkanet, *Anchusa tinctoria*. Bugloss is from the Latin *buglossa*, "tongue," descriptive of the shape and rough surface of the leaves. Alkanet is said by Parkinson to be a corruption of its French name *Orchanette;* but the real derivation of the name is supposed to be from the Arabic name *al-chennah*, the colouring matter with which Eastern ladies impart a red tint to their nails. The Evergreen Alkanet is *Anchusa sempervivens*, native of Western Europe (naturalised in Britain); the roots of this yield a reddish dye, but very inferior to that obtained from the *A. tinctoria*. Alkanet is a dye-drug obtained from several plants of this family, and it is extensively used by dyers, by druggists, by perfumers, "and by vintners for colouring adulterated wines, of which spurious port contains a considerable quantity."

The Bugloss has been made the emblem of falsehood, because the roots of one of its species are used in making rouge for the face. In the wilds of America the Indians paint their bodies red with the roots of a Bugloss (*Anchusa virginica*) indigenous to their country.

The best known is *Anchusa italica;* this is the Italian Alkanet, and is a very handsome, vigorous, and showy plant: the flowers are of a beautiful blue hue, and are produced in early summer. It is a native of France and Italy, and does well in ordinary garden soil, being propagated by division of the roots, and by seed. It is a plant that should be largely grown by persons who keep bees, as they appear to be very fond of it. *A. angustifolia* produces bright blue flowers; *A. incarnata*, dark blue blossoms. All the foregoing are true perennials. A biennial form, named *capensis*, a native of the Cape of Good Hope, makes a pretty garden plant, and can easily be grown from seed. They do well in the garden border. The beautiful blue of the Anchusas makes them great favourites in the garden.

Antennaria (*Cat's-foot*).—This is a small genus belonging to the Gnaphaliums, and so named from

antennæ, "feelers," in reference to the downy heads of flowers. The common name of Cat's-foot is said to have been bestowed from the same cause. There are but a few species and varieties composing the genus, and but three or four of these are grown, and they are decidedly useful plants in the garden. *A. dioica*, sometimes called *Gnaphalium dioicum*, is a little creeping perennial from Northern Europe (Britain) and America, also known as the Mountain Everlasting. The leaves are of a silvery-grey tone; the flower-stems four inches or so in height, bearing four to six flower-heads close together at the apex of the shoot; the flowers are white and pink. No Alpine plant is more worthy of cultivation, whether for rockwork, for pots, or for the front margin of the mixed border, or as an edging to beds of bulbs and Alpine flowers; used in such a way the plants form neat close-spreading tufts, dotted over with singularly pretty everlasting flowers in May. It is a plant that appears to thrive in the low open border on good soil near London, as well as in more elevated and favourable spots. It is perfectly hardy, and may be increased to any extent by division. A variety of this, named *minima*, is a very small form that can be grown in the same way. *A. hyperborea* is the Northern Cat's-foot, and by some is considered to be a variety of *A. dioica*, with both sides of the leaves woolly. It is a native of the Isle of Skye. The best known is *A. tomentosa*, the Silvery Antennaria, and this is perhaps the best of all the dwarf silvery-leaved plants for garden purposes. It is very dwarf and spreading, scarcely rising above the ground, but forms a dense carpet of little, flat, spreading silvery leaves. It may be said to carpet the ground with silver, and, as it is barely an inch in height, it requires to be cut off from coarser plants by a line of some subject of moderate size, or by a bare space, and to be planted in a rather wide belt. It is a native of the Rocky Mountains, and though of comparatively recent introduction, it has spread so rapidly throughout the country because of its usefulness, that it may be said to have become common in gardens. But it should be planted on light warm soils; on low, heavy, clay ground it will perish during winter. When used in the flower garden during summer it should be divided and re-planted annually, as it does so much better when treated in this way.

Asphodelus (*Asphodel*).—This is said to be the flower that flourished in the Elysian Fields. *Asphodelus* represents a genus of hardy herbaceous perennials that will do well in any good garden soil. The few fine forms commonly grown are natives of the South of Europe, and have been cultivated in English gardens for more than a century. The best known are—*A. luteus*, the Yellow Asphodel, an ornamental perennial, growing from three to four feet in height, producing yellow, or bright yellow flowers, continuing in bloom for a considerable time. (The proper name is *Asphodeline lutea*.) We have seen this in fine condition in a deep and rather dry sandy loam. There is a double variety that deserves a place in the hardy border. *A creticus* is the Cretan Asphodel, a native of Candia, and is also yellow-flowered. One of the best known is *A. ramosus*, the Great Asphodel, a bold vigorous perennial, producing from a slight root a number of stout branching stems, from three to four feet in height, covered with white flowers. It is a very useful plant for shrubberies and herbaceous borders; it is perfectly hardy, and will thrive in any good garden soil.

The Asphodel appears to have been much associated with the ancients. Homer tells us that, having crossed the Styx, the shades passed over a long prairie of Asphodel; and Lucian makes old Charon say: "I know why Mercury kept us waiting so long. Down here with us there is nothing to be had but Asphodel, and libations and oblations, and that in the midst of mist and darkness; but up in heaven it is all bright and clear, and plenty of ambrosia there, and nectar without stint." The fine flowers of this plant of the infernal regions produced grains which were believed by the ancients to afford nourishment to the dead. Accordingly, we find that the Greeks planted Asphodel and Mallow round graves. The edible roots of the Asphodel were also wont to be laid as offerings in the tombs of the departed, and, according to Hesiod, they served as food for the poor. Asphodels were among the flowers forming the couch of Jupiter and Juno, and Milton has named them as put to the same use by Adam and Eve. In Barbary the wild boars eat the roots of this plant greedily, and in hunting for them they turn up large spaces of ground, rendering it fertile by this mode of ploughing.

Barbarea, or *Cress*.—What is grown in gardens as the American Cress is *Barbarea præcox*, the Early Winter Cress; it is also known as the Belleisle Cress, but why these two names were bestowed upon it we are unable to say, as it is a native plant. Chaucer calls the Cress by its old Saxon name of *Kers*, which may possibly have been the origin of the vulgar saying of not caring a "curse" for anything, meaning a Cress. As the American Cress is treated of under the head of Herbs or Saladings, in Vol. I., it is only introduced here to call attention to a useful form, with variegated foliage, of *Barbarea vulgaris*, known as the Variegated Cress (*Barbarea vulgaris fol. var.*), which makes an excellent spring plant, being very gay quite early in the year. It is

a biennial, and should be raised from seed every year, sowing in the open ground during the spring, and in this way good strong plants can be planted out in autumn. It is quite hardy, standing unharmed through the severest winter. How this variegated form originated we cannot say, but it is quite worthy the attention of our readers who are interested in hardy spring-flowering plants.

Calandrinia.—This is a genus named after a German botanist, Calandrini. Several species have been introduced from time to time, but those at present cultivated can be reduced to a few pretty annuals introduced from Chili, such as *C. discolor*, rose, which is also known as *C. elegans*; *C. grandiflora*, purple; *C. rosea*, rose; and *C. speciosa*, purple; the latter is very pretty indeed, and all do well in good garden soil. *C. umbellata* is a half-hardy annual from Peru, by some considered to be a perennial; so very dwarf as not to be more than three inches in height, and producing numerous flowers of an intense magenta-crimson colour. This is a beautiful plant for rockwork; if it can establish itself in any cool spot it flowers grandly, and for a considerable period. We would advise that this, and *C. speciosa*, be also grown in pots. All that we have named can be raised from seeds.

Callirhöe.—This is a small group of plants, handsome in appearance, blooming freely from three to five months continuously; rich in colour, and the flowers good in form. The name is of Greek origin. There are two that come under the denomination of half-hardy annuals, viz.—*C. digitata*, dark rose; and *C. verticillata*, purple: the seeds of both these should be raised in a gentle heat, and then transplanted to the open ground to flower. *C. involucrata*, though classed with the half-hardy annuals, is really a very charming dwarf prostrate perennial, producing numerous large violet-crimson blossoms, fully two inches across, and grows to the height of about six inches. It does well in light loam, and always delights those who cultivate it.

Caltha palustris (*Marsh-Marigold*).—The generic name *Caltha* is in all probability derived from *kalthe*, the Greek for an urn, or drinking-cup, which the flower sometimes resembles in form; *palustris* alludes to its being found only in wet, marshy places. The English name, Marsh-Marigold, alludes to the same characteristic, and to the yellow colour of its flowers. Gerarde states, "In Cheshire, and those parts, it is called *Bootes*," but why, he does not record. Parkinson states that by some it was called *Gouldes*, to which name its golden flowers are an index. According to Rapin, the Sicilian shepherd, Acis, originally discovered the Marsh-Marigold growing in his native pastures:—

> "Nor without mention shall the Caltha die,
> Which Acis once found out in Sicily;
> She Phœbus loves, and from him draws her hue,
> And ever keeps his golden beams in view."

The flower's modern Italian name, *Sposa di Sole*, has probably been given to it in reference to this legend. On May-day country people strew Marsh-Marigolds before their doors, and twine them into garlands. Some think the *Caltha palustris* to be Shakespeare's "Winking May-bird with golden eye," which if plucked with due care, and borne about, will hinder "any one from speaking an angry word to the wearer." (Folkard's "Plant Lore.")

Caltha palustris is to be found in marshy places, in moist meadows and margins of rivers, brooks, &c., throughout Europe, Western Asia, and North America. It flowers in spring, and continues into early summer, bearing large, bright golden-yellow flowers, of a showy character. There is a double form that makes a handsome border plant, and does well in a deep, moist, sandy loam. It is a moisture-loving plant, and will deteriorate in a dry soil. It grows to a height of about a foot. There is a very dwarf free-flowering variety named *nana*, also with double flowers, earlier to bloom than the taller-growing form. Few plants will be found more ornamental on the margin of the pleasure-ground lake, where the rich golden blossoms are reflected with admirable effect. The varieties of this plant are increased by division of the roots.

Calystegia (*Bearbind*).—The generic name is derived from *kalyx*, "a calyx," and *stega*, "a covering," in reference to the calyx being hid by two bracts, as is the case with a section of Bindweeds. It is also known as the Bindweed, but this applies more particularly to *Convolvulus arvensis*, because of its tendency to twine about the stalks of corn, or round any erect plants, and, devoid of support, it will creep along a hedge-bank, or even over a heap of stones. It is to be seen everywhere along the road-sides, and in our fields; the white flowers being flaked more or less heavily with rosy-pink. The Great Bindweed (*Calystegia sepium*) is a striking climber, hanging its pure white bells in every hedgerow. Its leaves are large, of a full green, and heart-shaped. The Calystegias are aristocratic Convolvuluses, and two very fine single forms are to be met with in gardens, viz.—*C. incarnata*, rose; and *C. grandiflora*, pure white. If planted out in a good deep loam they grow freely, and establish themselves, throwing up in spring strong shoots that need something to twine about, and they flower very freely and finely. In the autumn they die down completely. *C.*

pubescens flore-pleno is the Downy Calystegia from China, and is a very pretty free-flowering species, producing large double rose-coloured flowers; it is one of the prettiest of our hardy climbers, will grow in any soil, and continues in flower all the summer. We prefer to give this species a light soil and a warm aspect; and, like the preceding, it dies in autumn, coming up again in spring. We have seen it used with great effect in London for forming small bowers, &c., in balconies, and there it is grown in pots. *C. oculata* has large creamy-white flowers, coloured in the centre with chocolate, and it is a very effective climber. They are all increased by division of the roots, which run very much in the soil.

Cardamine (*Cuckoo-Flower*).—Every lover of the country knows this pretty subject, so familiar an ornament in most woods and fields, and it is abundant almost everywhere. This is *Cardamine pratense*. The colour of the flowers varies to every shade between white and full lilac. The generic name is a diminutive of *Kardamon*, the Water-Cress, which some of the species resemble in flavour. *Pratensis*, "of a meadow," alludes to its usual place of growth. It is called the Cuckoo's flower because it flowers in April and May, when, states Gerarde, "the cuckoo doth begin to sing her pleasant notes without stammering." It is also called the *Lady's-Smock*, and this popular name was, as some say, probably applied by the monks in days when each flower was dedicated by them to some saint about the time of whose anniversary it began to bloom. The more generally received notion is that it was so named from the resemblance of its white flowers to little smocks hung out to dry, as they used to be once a year, at that season especially. Shakespeare alludes to it in these lines:—

> "When Daisies pied and Violets blue,
> And Lady-smocks all silver-white,
> And Cuckoo buds of yellow hue,
> Do paint the meadows with delight,
> When shepherds pipe on oaten straws,
> And maidens bleach their summer smocks."

The Cuckoo buds alluded to by Shakespeare are probably some species of Ranunculus, and, as Mr. Folkard states, as the *Cardamine pratensis* is rather a pale blue than a silver-white flower, the allusion in these lines perhaps applied to *C. amara*, whose brilliantly white blossoms might well be taken for linen laid out to bleach. The Cardamine is also known as the Meadow-Cress.

A double variety of *C. pratensis*, a natural sport, makes an admirable border plant. It does well on rockwork, or any place that is moist, and in a good sandy loam. It is also a charming subject for cultivation in pots. It is easily increased by root division. *C. asarifolia* is a free-growing white-flowered species which makes good border plants; so does *C. latifolia*, which bears large heads of rosy-purple flowers. This is a native of the Pyrenees and South of France, on the banks of streams, and must, therefore, be grown in moist places. *C. trifolia* is the Three-leaved Cardamine; it is a dwarf plant, with dark green foliage, bearing heads of snow-white blossoms in spring; but it must have a shady, moist position. It is found on the shady parts of mountains in Central Europe.

THE HARDY FRUIT GARDEN.

By D. T. Fish, assisted by William Carmichael.

THE PEAR.

WITHOUT doubt the Pear is the best of all our hardy dessert fruits. Its size, its flavour, its colour, the length of time it remains in season, girdling the year round with its luscious aroma, all raise it to the first rank as an important factor in the dessert.

Not a few popular errors prevail in reference to the tenderness of Pears, the difficulties of cultivating them, and the time needed to bring them into fruitful condition. "He that plants Pears, plants for his heirs," has limited Pear-planting to a most disastrous extent. Not only is there less truth in this old saying than in most, but, in view of modern methods of culture, it may be said to be totally destitute of truth. Pears may now be forced into fertile ways almost as rapidly as Apples, as we shall see, that is, on the very heels of growth. Scarcely is wood made and matured till fruit follows. The so-called tenderness of Pears is a misleading mixture of myth and reality.

The Pear is a stubborn old native British plant, and is found wild in Scotland and other parts of the kingdom. As if this were not proof positive enough of its hardiness, it is also found wild in Russia, Sweden, Denmark, and other northern and southern countries. It has almost the widest geographical range of any of our cultivated fruit, and if not exactly found from China to Peru, is, at least, distributed pretty freely from Scotland to China. Doubtless, in pursuit of size and quality, we have, in the case of not a few of our finer varieties, lost somewhat of the hardiness and power of endurance that characterised the original Pear, and not a few of its old English offshoots.

The Pear is, perhaps, the most malleable—the word seems more emphatic than improvable—of all our

cultivated fruits. Originally hard, dry, austere, but a few removes from the wood of the branches on which they grew, they have become sweet, rich, mellow, luscious, aromatic, "meaty" to the highest degree. The last word is the oldest and most emphatic, and may suggest that the Pear was looked upon as food at a time when the common name of food of all kinds was "meat." But probably the idea was simply "fit to eat," in opposition to the hard and austere Pears that were then considered the only fit and proper sorts for cooking, and this mistake can hardly be yet said to be remedied, though now the majority of sensible pomologists bake their very best dessert Pears, and find these, if baked sufficiently early, the best of all for cooking in every way.

Longevity of the Pear.—This is proverbial, and it probably exceeds that of all other cultivated fruits, with the exception of that of the Mulberry. Pear-trees are still intact and in bearing that have lived for three or four centuries. Its hardy origin and splendid constitution stand it in good stead in its contest against time and the rugged, stern severities of our climate. And though the set has turned against large fruit-trees, it is to be hoped that in park, orchard, or sheltered wood, spaces will always be found for a goodly number of Pear-trees, to grow up into full stature at leisure, and assume their natural form and character with a minimum amount of interference from the cultivator.

Improvement of General and Local Climate.—This has already been treated of under the head of drainage and cultivation of the soil. A good deal may be done for Pears by raising the roots, either partially or wholly, above the surrounding level. By such simple mechanical means the roots may be lifted bodily out of wet or ungenial subsoils, or barren and unsuitable surface soils.

In very dry and poor localities the very opposite plan may at times be adopted with the happiest results. Pits may be dug out bodily, a yard or more in depth, and two across, and these filled in with stiff turfy loam, that best adapted for Pears, and the new level left from three to six inches lower than the natural one of the surrounding district, thus insuring a plentiful supply of water for the Pear-trees from the overshed from the natural soil contiguous to them.

It is astonishing what improvements in local climate may be effected by thorough drainage, and the substitution of an arable for a grass surface. The first will often effect a rise of five or more degrees in the temperature. Nor does this represent all the gain. The rise will be greatest, or what amounts in Pear-culture to the same thing, the depression will be least when heat is most needed. For example, in the early spring, when every molecule of heat may be needed to combat successfully the repeated efforts of spring frosts to destroy the Pear-blossoms, every drop of water sent down through the surface strata instead of being lifted off it, conserves the heat of the local atmosphere, and thus contributes to the safety of the Pear-bloom.

Again, the difference of temperature between a bare arable surface and one of grass in the early spring is so great as to make all the difference between the safety and destruction of the Pear-bloom. The earth absorbs the solar heat gradually by day, and parts with it during cold nights with sufficient rapidity and volume to keep the local atmosphere warm enough to save the bloom from destruction. The looser and more bare the surface of the earth, the more efficient as a local warming-pan for the trees. If too dark and too heavy it would absorb heat too rapidly, and lose it too soon to do its amelioratory work on the local climate efficiently. But calcareous loams of rather a light colour, of a loose texture, do much to make Pear-culture possible on sites and in climates where it would otherwise be almost hopeless.

On a cold sunny day in March two years ago, the writer had occasion to pass from the sheltered to the exposed side of a belt about fifteen yards wide. On its south-western side Primroses were in bloom, the Sweet-briar shootlets were two inches long, and Lilacs were showing their large white buds swollen and bursting through. Even the Chestnut and Sycamore buds had swollen; the air was soft, almost as a May morning, and the birds were singing, wondering at the early spring, and laying all sorts of precocious plans for nest-building. On the north-eastern side winter reigned in full vigour and severity, with no sign of budding life nor coming spring. And yet all the difference arose from a thin screen of living vegetation, efficient for protection almost in the ratio of its flimsiness. Evergreen trees are still more powerful warmers and ameliorators of local climate. A double or treble line of Spruce or Scotch Firs on the exposed side of Pear-trees would enable them to be grown successfully in thousands of districts where their culture would be otherwise hopeless. Beech, Hornbeam, Arbor Vitæ, or Yew hedges are still more potential ameliorators of local climate, and are not only far cheaper but more efficient than walls.

Selection of Favourable Local Climates for Pears.—These abound in most neighbourhoods, and even in most gardens, or the surroundings of the house or outhouses, however small. The sunny sheltered sides of hills; warm sites near hedges or plantations; southern and western aspects of walls; the cosiest nooks and corners in shrubberies, pleasure

grounds, parks, woods, or gardens—these and such as these favoured spots for Pears should be sought out and utilised. It is altogether a mistake, pregnant with, perhaps, nine-tenths of the failures in Pear-culture, to plant Pears as a matter of course where Apples or Cherries may do fairly well. Of course, in good all-round climates, such as Kent, Surrey, Herefordshire, and other favoured counties, Pears may be planted with Apples and thrive equally well or better. But in many other counties it is widely different. In these the Pear needs warmer sites, cosier nooks and corners, more shelter and care, than the Apple or any other hardy fruit.

As an illustration, it is no uncommon thing to meet with magnificent Pear-trees of such fine sorts as the Jargonelle, Maria Louise, Easter Beurre, Glout Morceaux, and even the Chaumontel, more tender than either, on the gable-ends of dwelling-houses, where such varieties will hardly live in the open gardens or orchards close by. The *warmth* of the chimney makes all the difference. And some of these trees and their fine produce would pay well for a few extra shovelfuls of fuel thrown on the last thing during frosty nights in April, when the trees are in bloom.

The Selection of Pears for Local Climates.—This important branch of the subject may be said to be yet in its infancy, and but little positive can be stated on the subject. It seems likely, however, that Pears grafted on the Quince are hardier than those worked on the Pear, and were the latest available varieties of either chosen as stocks valuable results might follow. As the Pear also takes fairly well on the common White-thorn, it is possible that some of the many species of *Cratægus* may et be used to impart greater hardiness, or what would practically almost amount to the same thing, retard the somewhat precocious development of our Pear-blossoms and shoots in the early spring. All this is of necessity somewhat speculative and problematic. What is certain, and is being more clearly demonstrated by every year's additional experience, is that could we hold back our Pear-bloom a few weeks longer in the spring, good crops would become the rule, not the exception.

Means for protecting Pear-blossom will come under consideration in our general culture; and there is but little to add here on culture as a means of modifying climate or the better fitting of the Pear to the climate. Root-pruning, frequent lifting of the roots in the early autumn, would, doubtless, do something towards the latter. Such violent disturbances check, and hence hinder and delay growth. Growth retarded in the autumn means a late start in the spring, and so severe at times and long-continued is this interregnum to growth, that the trees may be a month later in blooming in consequence. This month's grace in blooming-time in the spring, or even half of it, is often sufficient to save the Pear crop of the season.

Late pruning is another alternative towards the better suiting of Pears to local climate. The late pruner has forced his growing branches to decoy the sap away from the expanding flower-buds, which are then retarded through a diversion, as well as a diminution of volume, of the advancing current of fluid. By this compound action of the decoy wood-buds the pressure on the fruit-blossoms has been lessened, and the speed of their growth slackened. The late pruner virtually blows off vital force or steam, though the shoots be cut off after they have broken into leaf. The importance of this slackening of the speed of the growing blossom-buds, and delay of opening in the spring, can hardly be over-estimated. A fortnight's delay in the opening of the flowers of Pears in the spring makes all the difference between a crop of fruit and complete failure, in many of our fickle seasons.

The fitting of varieties for special conditions can only be done through careful observation and a wide experience. Certain sorts and varieties of Pears seem more or less closely linked to different localities. This is especially so with such fine varieties as Maria Louise, Glout Morceaux, Beurre Diel, Winter Nelis, &c. Even quality as well as fertility run in geographical lines or on geological zones at times. It is only by carefully marking, learning, and, as it were, inwardly digesting, the Pear produce of differing localities, that one can give a sure and safe answer of what Pear to plant in given districts, with the surest prospects of pleasure or profit.

PROPAGATION.

There are but four general methods of propagating the Pear—by seeds, scions or buds, cuttings, and layers; and as the propagation of the Pear by these methods differs but little from that of the Apple, already described in detail, it will only be needful to note those points on which the two differ. Hence, in all points on which the instructions may seem imperfect or incomplete, the reader should see APPLES.

Propagation by Seeds.—This is pursued for two distinct and almost opposite objects, the origination of new and better varieties, and the providing of stocks on which to bud or graft existing sorts. In regard to the first, the majority of pomologists start too late, and hence, possibly, the chief reason why such scant success has been attained by English growers. They begin with the seed, whereas they ought to start with the flower. In the seeds the

future characteristic of the seedling already exists in embryo, and their character can neither be modified nor improved, but simply developed by the cultivator.

The Pear has a stronger tendency to reversion, or degeneration, than most of our cultivated fruits. Probably less than one per cent. of seedling Pears will equal their seed-parent, while hardly one in a thousand or two thousand will yield such superb Pears as Glout Morceaux, Maria Louise, Winter Nelis, or Easter Beurre.

These facts are not quoted to discourage amateurs or others from raising seedling Pears, for some of them have been the most successful, but as a strong argument for taking every possible means to command success. One means is to sow only the finest seeds out of the finest Pears. The attempt must also be made to improve the seed in the making. This is done by crossing two fine varieties, such, for example, as Maria Louise and Easter Beurre, Beurre Diel and Winter Nelis, Glout Morceaux and Louis Bonne of Jersey, Williams' Bonchrétien and Passe Colmar. It will be observed that in each of these two Pears one contrasts with the other in season, size, or quality. But such contrasts are not necessary to insure success. Pears may be mated for improved seeds on the principle of harmony as well as of contrast, and the chances of success are about equal on either principle. All that is needful is to remove the stamens early from the seed-parent, and apply foreign pollen to the pistil. In crossing Pears, however, in the open ground, the pistils of the seed-bearing parent must be carefully protected from chance pollen, by the use of muslin bags, or other means, else will the bees, the butterflies, and the breezes make sad havoc of our systematic and scientific attempts at the improvement of our Pear-seeds. Notes should be made of all such essays, and then when the experimental Pears are eaten the seeds should be sown at once, and a record kept of the pedigrees of the seeds. All such data would immensely deepen the interest and increase the zest of Pear propagation by seeds in search of new varieties.

The Sowing of the Seeds.—There is no better method than that of sowing Pear-seeds so soon as the fruit is eaten. Out of the fruit into the earth, is the safest motto for such valuable property as carefully hybridised or saved Pear-seeds.

The simplest and safest way is to sow all such Pear-seeds in, say, six-inch pots, at the rate of a dozen seeds in a pot, leaving as much as an inch and a half unfilled. Place a sheet of glass or a slate over them, and leave them either in a sheltered spot in the open, or a cold pit, free from frost, until the plants come through the soil; this will mostly be the following spring, say March or April, when the plants may be placed in the open air, well watered throughout the summer, and turned out in the open, as directed for Apples, in the autumn.

A Season Saved by Sowing in Heat.—Place in a gentle warmth, say 55°—60°, until the middle or end of May. Under this fostering treatment each seedling should be potted up so soon as it has made three proper leaves, into a three or four inch pot, returned to warmth, and pushed on as rapidly as may be. If kept under the shelter of an orchard or other house, it will be sufficiently strong to have a six or eight inch pot, and will probably have reached to the height of a yard before the autumn. The extra fostering will enable the seedling to do two or more years' work in one. There is also a middle course, which gives great strength and saves much time, with less trouble. This consists in fostering the plantlets as much as possible, and growing each in separate pots till June, then turning them out in the open, in light rich soil, in which they will grow freely, and also mature their growth before the end of the season. The means of forcing early fertility in seedling Pears differ little if at all from those described for Apples at page 166, Vol. II. Some, however, assert that by using the middle portion of the shoots for scions the seedlings can be proved sooner than by using either their tops or bottoms. Doubtless, the mode of growing seedling Pears for the first season under glass, by heightening and hastening their maturity, also greatly hastens their fertility; while the working of them on dwarfing and fertilising foreign stocks, as the Quince, tends to further the same great end, the early proving of the seedling Pears. As a rule, too, fruit-bearing is much hastened by working the seedlings on fertile varieties—such, for instance, as Louis Bonne of Jersey—in full bearing, and also on medium-sized and specially fertile branches of the same; the principle of like begetting like apparently having a certain degree of potentiality under such conditions.

Once more, some authorities, with an eye to purity of blood, recommend those in search of improved and superior varieties to select their seeds only from trees worked on Pear-stocks. It is also thought by some—a very old idea among Melon and Cucumber growers—that by subjecting Pear-seed to extra drying, or keeping it out of the soil for six months or so, the fertility of the seedling may be hastened.

The Saving and Sowing of Pear-seeds for Stocks.—Possibly were more attention devoted to this matter better stocks might be introduced than any that Pear propagators are yet able to rely upon. What is really wanted and ought to be forthcoming,

is a Pear stock of as clearly defined and reliable qualities as the French and English Paradise stock for Apples: a stock to control growth and compel fertility. Neither does the use of the Quince relieve pomologists from the duty and necessity of finding a Pear stock possessing parallel merits to the Paradise stock for Apples. Useful as the Quince has been, it is but an interloper at best, and in some senses a backward step. Its influence is capricious rather than constant, ruining the quality of some Pears, weakening the health of others, greatly curtailing the lives of all. We purchase fertility too dearly through the Quince. Possibly the desideratum of a Pear stock that might be relied upon to heighten the fertility of Pears, without lowering the quality of the fruit or shortening the life of the tree, may be found among such varieties as Louis Bonne of Jersey, Beurre de Capiomont, the Old Swan's-egg, or similar moderate-growing fertile varieties.

The mere sowing of Pear-seeds for stock, and their treatment till of sufficient size and strength for working, does not differ materially from those of Apples, and will be found set forth on page 166, Vol. II.

The Raising of Seedling Quinces.—As the Quince seldom ripens seeds in England, and the raising of these does not greatly differ from that of Pears, little more need be said upon it here. Seeds and seedlings are prettly largely imported. These are mostly kept very dwarf, as the theory and practice of most growers are to have as little Quince in their Pear-trees as possible. Hence, though seedling Quinces grow rather more slowly than Pears, they very often become fit to work sooner. There always seems some little doubt as to the Pear's ability to stand alone on the Quince. Hence it is mostly worked so low down as to allow of the Pear rooting over the Quince into the ground on its own account—a process that either fails to take place, or succeeds in removing the restraining influences of the Quince over the Pear. On the other hand, however, the Quince brings both more numerous and more fibrous surface-rooting roots to the help of the Pear, induces a more dwarf habit, renders the tree easily portable, imparts, as a rule, more colour, and more seldom a higher flavour to the fruit.

The Pear will also grow on the common Thorn, the Mountain Ash, and the Medlar, but with less freedom and permanency than on the Quince. So there cannot be a doubt that the seedling Pear is the best stock for the Pear. These seedlings are now of several degrees of excellency—the wild Pear, the perry Pear, the common orchard, and best garden Pear—and no doubt among the latter a still better stock of more uniform excellency will yet be found.

Grafting.—The grafting of Pears does not differ in principle and practice from that briefly described for Apples, page 167, Vol. II., and also in our articles on Propagation. Whip grafting is the best for young trees and for dwarfs. It is a good plan, after claying the grafts round on the latter, to earth them up an inch or two beyond the point of union and over the protecting clay. Pears in general, however, and those on the Quince in particular, should be grafted rather earlier than Apples. The Pear grows earlier than the Apple, and the Quince earlier than the Pear—hence the advice now given.

In dealing with two such different plants as the Quince and the Pear, it is indispensable that their growing condition should be brought more nearly abreast by art than they would be likely to be through nature. In a word, left to themselves, the Quince would be too far ahead of the Pear in March, say, to insure success. The best way of retarding the Quince and scions of the Pear alike until grafting-time, is to take off the scions and lay them in the ground in December, and behead the Quince in January, and within a few inches of the spot for grafting. With scion and stock in suitable condition, a good fit, expert workmanship, speedy exclusion of the air, and firm binding together, a union is almost certain, whichever one of the many methods of grafting is adopted.

Another element of success, however, consists in a vigorous condition of growth in the stocks. Hence the importance of lining them out two or more years before working. Close to the ground, as already stated, is the best place for working the Pear on the Quince. The height is of less moment on Pear stocks. Low working is, however, the best for dwarf bush trees, cordons, and pyramids. For standards of all heights it is often a considerable saving of time and vital force to work the stocks at heights varying from three feet to six or more, according to the height the trees may be required for parks or orchards.

The best sort of Pear scions are those of moderate growth, chosen out of about the middle portion of shoots, growing in a semi-horizontal rather than a vertical direction.

Double or Multiple Grafting (Fig. 32).—This must be looked upon rather as a mode of culture than a means of propagation. It is, however, both, and as it may become more important, deserves notice here. Its theory rests on a mechanical rather than a vital basis, though, of course, it becomes a mixture of both. One or more foreign discs of living wood are introduced in the stem to foster, check, moderate, or control the passage of the sap. Hitherto the practice has been chiefly confined to Pears, but there is no

reason that it should not be extended to other fruit-trees, and it has been so applied to Grape-vines, &c. Of course, the closer the affinity between the different scions used, the less effective for obstruction or interference in double or multiple grafting. Hence, as there is considerable disparity of structure and rate of growth between the Pear and the Quince, the introduction of a piece of Quince wood between the seedling or wilding and the bearing Pear has been found to increase the fertility of the latter. Again, some Pears on the Quince grow indifferently; and a free-growing Pear immediately over the root of the Quince, and this again worked with the desired variety, has been found to answer well. The late Mr. Thomas Rivers, of the Sawbridgeworth Nurseries, Herts, the originator of this method of culture, saw in it the germ of the greater stability of Pears on the Quince, and of freer growth and higher fertility for many varieties. Since the death of this gentleman, to whom we are indebted for so many of our fine modern Peaches and Nectarines, less has been heard of the practice, and double-grafted Pear-trees are seldom offered in the trade lists. Still the practice is full of scientific interest, and of practical results of great importance. Among the more notable failures of Pears on the Quince are the Maria Louise, Knight's Monarch, the fine old Aromatic Pear, the Seckle or Trout, Gansel's, and other Bergamots, Jargonelles, and some of the new Pears, such as Victoria and British Queen. *Per contra*, some Pears, such as Beurre d'Amanlis, Conseilleur de la Cour, Prince Albert, &c., take so freely on the Quince, and live so long on it, that they have become as it were the missing link between the Quince and those Pears that refuse to grow freely on it. Introduce those intermediary Pears between the two, and the weakly-growing Pears become strong, while the sterile sorts, such as Jargonelles, Bergamots, &c., become fruitful.

Fig. 32 gives an illustration of double grafting. The base of the tree, *a*, is Quince, worked with the intermediary Pear, Beurre d'Amanlis, *b*, to insure growth. This is worked the following year with Maria Louise or any other Pear, *c*, and it is found that growth and fertility are thus nicely matched, and the result gives great satisfaction. Of course multiple grafting may be carried to any extent, though in actual practice it has seldom been carried further than double grafting.

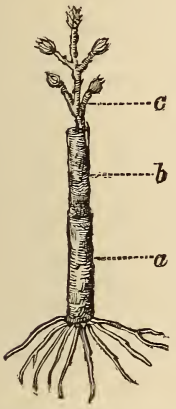


Fig. 32.—Double Graft.

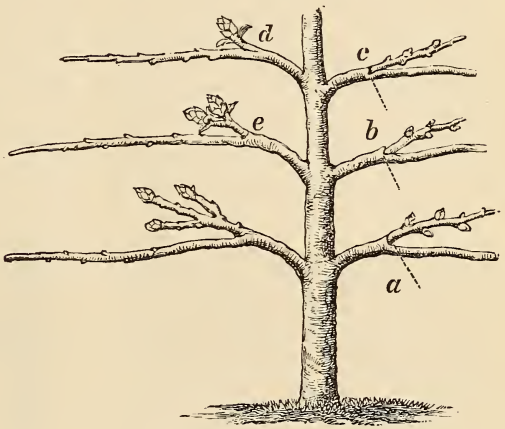


Fig. 33.—Branch Grafting.

Branch Grafting.—This is more a mode of culture than a means of propagation, but it will be most convenient to advert to it here. It differs from other grafting in little excepting the place and the object of it. The place is on one or several of the side branches, and the object generally is to resuscitate dilapidated trees with a fresh stock of wood, or substitute several varieties for one; also to furnish barren branches with fruit-buds. In Fig. 33 all these objects of branch grafting are illustrated. So soon as the scions are thoroughly established, the original branch is cut off at the cross dotted line near to *a*. The branches *b*, *c*, are treated in the same way, and on each a different variety of Pear is used. In this way, and by working each separate branch with a distinct sort of graft, a useful collection of Pears may be grown on one espalier or wall tree. The other side of the tree is treated in quite a different way, to illustrate the mode of furnishing semi-barren trees with fruit-buds, as explained presently.

Propagation by Cuttings.—Practically this is but seldom resorted to. It is so much easier to raise stocks from seeds and then graft the superior sorts on the seedlings, that the raising of Pears from cuttings has been rather neglected. It is however, practicable with the majority of sorts, and of the usefulness and fertility of own-root Pear-trees there can be no doubt. There are two seasons when Pear-cuttings may be inserted with fair hopes of success. One is the dead season, say from October to the end of December, the earlier the better; the other is about the middle of July. The cuttings should be very similar at both seasons, a small piece of moderate-sized wood, from six to nine inches long, an inch or so in diameter, with a heel (see Rose-cuttings, pages 102 and 211, Vol. I.) of old wood attached. These should be inserted in light sandy loam, and made as firm as possible. Of course the summer cuttings are inserted with all their leaves attached, unless those in the buried portion, and means should be taken by partial shade and overhead sprinkling to retain the leaves on the cuttings as long as may be. There are also other methods of rooting Pear-cuttings.

Propagation by Buds.—This is more practised with the Pear than the Apple. It is also adapted for several distinct purposes, as well as a means of propagation. It is a convenient method of posting branches where they may be needed for furnishing or renewal, or to make good accidental failures, and as a mode of inserting fruit-buds where few or none have been produced on a branch or tree. As a means of propagation, budding, though less certain than grafting, is often convenient. It is practised at a different season, so that stocks that may have failed to take by grafting in the spring, may be budded in the summer, and thus converted into Pear-trees before the end of the season. There is no better mode of budding Pears for purposes of propagation than the common shield budding practised on the Rose.

Fig. 34.

The treatment of the wood under the buds is quite a different matter. In budding at the proper season for propagation, the wood is best removed; sometimes, however, owing to peculiarities of season or of varieties, this is difficult or impossible. In such cases budding must either be left undone, or else the section of wood must be left under the bark intact. In such cases the segment of wood should be left as thin as practicable without unduly impinging on the root of the bud. (See Fig. 34.)

Budding at other Seasons and for other Purposes than Propagation.—On the Continent, where the grafting or budding of fruit-buds in the spring is much more practised than in England, buds something of the form or size of Fig. 35, with the woody sheath left intact, or clusters of buds as in Fig. 33, *d*, *e*, are mostly employed. When one bud, as in Fig. 35, is used, the process is called budding; when more than one, as in *d*, *e* (Fig. 33), it is called grafting. Skilfully performed, either process is alike useful and successful in transferring fruit-buds from where they are not needed to other parts of the same tree, or of different trees, where but for those transferred buds there would be few or no fruit.

Fig. 35.

Budding with wood-buds in a dormant state may also be practised in the spring to furnish shoots, branch, or buds, where there would otherwise be a deficiency. With more expert and skilful manipulation it would probably become possible to have a fair crop of Pears most seasons, as it is comparatively rare to find a season in which few or many Pear-trees are not so overcrowded with fruit-buds as to offer a sufficient surplus for furnishing many other trees. Fig. 36 shows the surplus bud in Fig. 35 safely transferred to the barren stem or branch of another tree.

Fig. 36.

Propagation by Layers.—This, though quite practicable, is seldom adopted as a means of propagation. (See Rose Layers, page 216, Vol. I.) Pear-layers, however, are treated somewhat differently, inasmuch as the entire shoots are generally covered with soil with the exception of a single bud or two. This, however, is by no means essential to success, though it is the best mode of raising Pears and Quinces for stocks.

Considerable difference of opinion prevails as to the best Quinces to grow for Pear stocks. The three best known are the Round or Apple Quince, the Oblong or Pear Quince, and the Portugal, with fruit something like the latter, and the largest leaves of any. This fact and its freer growth render it the most generally used. Others, however, contend that this Quince is too gross for the Pear, and that the weaker-growing and smaller-leaved varieties are the best for small bush-trees for pot culture, orchard-houses, &c.

So few Pears are grown on their own roots that

it is hardly worth while to name suckers as a means of propagation.

PLANTING.

The matter of planting has been so exhaustively dealt with in regard to the Apple (pages 249 to 253, Vol. II.) that it hardly seems needful to add much in regard to Pears, the general culture of which is almost identical; yet so important are Pears in a personal, pomological, and national point of view, that it will be wiser to run the risk of repetition than to leave anything unwritten that would interest or assist the general public.

Soil for the Pear.—In choosing a soil for the Pear it must be borne in mind that early and constant fertility for a quarter or half a century are the chief qualities for which we most prize the Pear; and among our first steps towards these attainments are the two arts of keeping its roots up and its tops down. The foundation of these must be laid in skilful planting, else will other efforts prove nugatory. Its boring tendencies may be arrested by amputation. This, for the moment, is a complete remedy; but unless it kills the tree the remedy is but temporary. With new roots comes the old boring tendency and power, and not seldom the last result of severely pruning Pear-trees has been worse than the first. Or the old roots may be finally got rid of. Finding the tendency of Pear-roots to run deeper and yet deeper down, the Pear is furnished with foster-roots on the Quince, that skim the surface.

But allurement is really the higher art, and may prove equally or more successful without resource to such violent remedies. Recognising to the full the descending character and boring tendency of Pear-roots, it is yet possible to tempt them by gentle means into the best feeding-ground, and to keep them there by other methods than amputation, or the substitution of foreign roots for their own. Two courses are useful to this end, the removal of all substances that are hurtful or distasteful to the Pear-roots, and providing them with all that is most attractive in the exact spot they are desired to occupy.

Where stagnant water exists it is useless to attempt growing Pears until it is removed. For the roots of Pears will not only find it sooner than those of Apples, but they will suffer more from it. Pears do fairly well in inferior soil and under unfavourable conditions of site and climate; but stagnant water at or close to their roots is fatal; a dry base is, therefore, the foundation of their successful culture.

The importance of a deep tilth will be obvious from what has already been stated. A mean of three feet has been given, but twice three to the water-line would be far safer, as on moist soils the water will rise several feet above the water-line, through the constant action and ceaseless energy of capillary attraction. This destroys the texture and converts in time the finest soil into something approaching sheer mud, totally unfit for the culture of Pears. Hence a porous bottom is essential to Pear-culture, and over this from thirty inches to a yard or some four feet of good soil.

The same soil as recommended for Apples will do well for Pears; a good holding fibrous loam, rather heavy than light, being the most suitable for durable results. Loams from old and moderately fat pastures, or roadsides, are the very best for Pears, and such loams should have no additions whatever. Once in full possession of such tempting soils, the roots seldom hurry out of them, and they, after a time, may have stronger and more attractive allurements provided for them in the form of surface mulching of manure or rich composts. These provide food in plenty, without any of the textural or other drawbacks incident to the use of solid manure in the composts.

The question of the best soil for Pears is, however, further complicated by that of stocks. Practically there may be said to be but two stocks for the Pear, the Quince and the wilding or seedling Pears. The Quince is not only more of a surface rooter than the Pear, but is far less particular about site and soil, and thrives under a far greater variety of conditions—for example, in lighter soils and damper situations. (See also Soils for Apples, pages 28 and 29, Vol. II.)

Sites and Shelter for Pears.—In discussing the bearing of stocks on soil, we have already touched on this subject, and have also referred to it at length in regard to Apples (page 27, Vol. II.). From the fact of Pears blooming earlier, they are yet more liable to injury, and the wreck of a crop often occurs from spring frosts in the trough of a valley, while those higher up on broken or rolling ground escape. In many districts the finer Pears need the shelter of dividing or encircling hedges or walls to bring them to perfection. Kitchen or fruit gardens in exposed situations should also have a second protecting line of shrubbery beyond the walls; and these secondary shelters should never, as they mostly do, follow the line of the walls, but proceed round the garden in a series of bold curves, the greatest convexity of the curves invariably presenting themselves to the force of prevailing winds, as these throw off and scatter to either side, most potently and efficiently, the currents of cold air.

The Shelter of Walls.—The higher in reason the wall, the greater its efficacy. But this general principle needs to be modified in practice by another and an opposite fact, that may be stated thus:—The efficiency of walls as shelters and ameliorators of climate is devised upon the give-and-take principle; in other words, in so far as the favoured side of the wall is more warm, the shady side becomes colder; and this principle of reciprocity in the redistribution of caloric acts as a wholesome restraint in moderating the heights of walls. In practice, perhaps, the most useful height of Pear walls for sheltering and fostering the trees is twelve feet. Occasionally they are much higher than this—fourteen, sixteen, and even eighteen feet. More frequently they are lower—six, seven, eight, nine, and ten feet being common heights. All these are rather low for developing to the utmost the ameliorating influence of walls on local climate, and developing to the full the fruiting and growing capacities of healthy Pears.

The warming power or heating force of walls is often much weakened by covering them too closely with the leaves and branches of trees. Such loose and verdant drapery absorbs and retains but little heat. Bricks, the best of all materials for walls, absorb, retain, and concentrate the solar rays into a sort of focus by day, thus raising the temperature many degrees, and distribute it by night, to counteract the energy of radiation. Each exposed brick, or part of a brick, thus becomes an absorber, storer, and distributor of heat, and the wall, as a raiser of local temperature, is efficient in the ratio of its baldness, or nearly so.

But, of course, walls are built chiefly to grow Pear or other trees on their surface, and the great practical problem for solution is the striking of a happy mean between the trees and the brick wall, so that the latter shall exert its maximum amount of heating force, and the trees produce as many and as fine Pears as practicable. To combine these two to most advantage, the branches should average about a foot between them, whatever method of training may be adopted.

There are also walls of dwelling-houses, farm buildings, stables, cart-sheds, carriage-houses, workshops, factories, and maltings. The latter are especially named, as some of the finest Pear-trees known to the writer are grown on maltings. Magnificent specimens of Maria Louise and other Pears are also grown on the gable-ends and other walls of lofty dwelling-houses. In planting Pears on specially high walls, special preparations should be made for them, and larger areas, nine or twelve feet over, and from four to five feet deep, should be carefully prepared for the trees.

Pears also do well on wooden fences or espalier rails, and may be planted thickly on these to form fruit hedges in genial climes and warm localities.

The Planting.—Little need be added here to what has already been stated under Apples. Pears, however, may be planted a fortnight or three weeks earlier.

The distance between Pears need differ but little from that of Apples (see Vol. II., p. 251). On high walls, and with vigorous-growing varieties on Pear-roots, the distances between Pears may be extended from twenty to twenty-five, or even thirty feet. In some of the old gardens the giant horizontal-trained Beurres and Bergamots used to be forty feet apart; for orchard Pear-standards, from thirty to thirty-five feet between the rows, and twenty to thirty feet from plant to plant. But all this refers to Pear-trees on the Pear. The use of Quince stocks, the practice of root-pruning, and the introduction of cordons and other small trees, have wholly revolutionised the old ideas of distance, and resulted in what the old Pear-growers would have called an absurd multiplication of roots to areas. They however mostly introduced a tall tree, or rider, between each two dwarfs. In addition to this, it was a common practice to plant twice as many dwarfs at first as were required. Similar modes of economising space were adopted in orchards. Temporary rows of trees, either dwarfs or standards, were planted between the permanent rows, and also between the permanent plants in the rows. By this simple method four times as many trees were grown at the first as were finally left, and the nurses or riders repaid the cost of their purchase and planting many times by their produce, before they were finally cleared off to make room for the permanent trees.

In orchards, again, or Pear gardens, it is customary not only to sub-crop with temporary trees, but with other crops, such as bush-fruits and Strawberries; and as the sub-crop is often almost as valuable as the super one, these under-crops exert a modifying influence on the distances of the Pears. Pears on the Quince and double-grafted Pears, also, should be planted as close again as those on the Pear. From fifteen to twenty feet apart is ample for Pear-trees on walls or espaliers worked on the Quince. It is customary to plant the same trees on espaliers four or five feet closer than on walls; as, of course, the espalier is not so warm, and does not foster growth to the same extent. From seven to ten feet would, therefore, be good distances for Pears on espaliers on the Quince.

Pyramids vary so much in size and character, and rate of growth in different localities, that they may have as wide a range of distance as from five to twenty feet. For semi-weeping pyramids or Quenelle

Pear-trees, distances of twenty, twenty-five, or thirty feet apart, are all alike good for profit and effect. With freer conditions as to distance, far greater freedom of growth may be allowed. Five or six feet apart are useful distances for ordinary pyramids. Planted about three rows deep in blocks, or as nearly as may be quincunx fashion, each plant will have as much room as possible in the most limited area.

Bush Pears may be planted from four to five feet apart on the Quince, and from five to six on the Pear. But it must be borne in mind that root-pruning and frequent transplanting will repress growth almost as effectually as dwarfing stocks, and that where these and also summer pinching have been persistently followed, or are meant to be adopted, own-root Pears may be planted almost as closely as those on the Quince. This is especially true of Pears struck from layers or cuttings.

Cordons, as a rule, may be planted at distances of one foot to four. Fifteen and eighteen inches are good distances for vertical or oblique cordons. Where the run is long it is well to allow six inches more, as cordons are apt to broaden at the base in the ratio of their length and their age. Double cordons should be planted double the distance, to permit of sufficient run on either side of the root-stock. U-shaped cordons on walls should not be nearer than two feet or thirty inches apart. Multiple, or three-branched cordons, should be planted three or three and a half feet apart. For diamond cordons the distance should never be less than fifteen inches asunder; eighteen is better. Even at these distances close spurring is needful, to prevent the diamonds growing up, and to insure abundance of light and air to every part of the tree and its fruit. There is yet another excellent use to which cordon Pears can be put, and to enable them to accomplish it well they should have ample space—say a yard, at least, apart. This is to run over iron or other archways or arbours spanning the central or other walks of the fruit or kitchen garden.

The roots of the Pear should be planted, that is covered, somewhat deeper than those of the Apple. It is not well to have the surface roots nearer to the surface than six inches. Rather more care must be taken in planting Pears on their own roots than those on the Quince. Pears, in fact, unless carefully prepared beforehand, do not move nor transplant kindly. The reason is obvious: they form very few fibrous roots, their fangs run down to unfathomable depths, and the major portion of these are mostly left in the ground through the thrust-and-pry mode of lifting Pear and other trees, in vogue in so many nurseries. These ragged, rent fangs must be carefully dressed before planting. As Pear-roots have such a strong tendency to descend, it is better in all cases, in planting Pears on their own roots, to take some precautionary measures to prevent this. The first consists in making the bottom of the hole as firm, smooth, and level as it can well be made. This simple preparation does much to give the roots a horizontal start, and if to this level hard base one or more slates or thin slabs of York or other stone are added, to forcibly check the downward digging tendency of Pear-roots, this will be all that is needful to give them a proper start, and to keep them in or near the surface tilths.

Full instructions as to filling up, &c., have already been given for the planting of Apples, pages 252 and 253, Vol. II., and there is little or nothing more to be added. Use no leaf-mould, manure, or other rich compost in contact with the roots, only the finest, sweetest soil, in which the trees are to be grown.

BULBOUS PLANTS.

By William Goldring.

Barnardia scilloides.—This little plant from Macao much resembles a dwarf spring Scilla. It is rather a pretty plant, producing in autumn dense cylindrical spikes of flesh-tinted small flowers. It is not very hardy, but succeeds in a warm sunny border in light soil. It is also worth pot culture under a frame or hand-light. It belongs to the Lilyworts, and is lately called *Scilla chinensis*.

Bellevallia romana.—A Lilywort, called also *Hyacinthus romanus*. It is a little dwarf plant, with grassy leaves, and has spikes of whitish flowers. It is not showy, and is only rarely seen except in full collections of bulbs. It is a native of France, the Pyrenees, and other southern districts, but is quite a hardy border plant with us. *B. dubia* is sometimes mentioned in bulb catalogues, but like *romana* is scarcely worth the attention of the general cultivator now that really beautiful bulbous plants are so numerous. There are two or three new kinds recently introduced, but they have not yet found their way into English gardens. One named *atroviolacea* promises to be a showier plant than *B. romana*.

Bessera elegans.—This is a charming Mexican bulb of the Amaryllis family, possessing elegant growth, bright and cheerful flowers, rendering it a most desirable plant for frame or green-house culture. It is of slender growth, the flower-stems being about a foot in height, terminated by umbels of star-shaped blossoms, each about an inch across, of wax-like texture. They are of a bright scarlet-red, the interior of the sepals being white, with a stripe of red on each, while the stamens are tipped with purple.

It is, therefore, different from any other bulbous plant in respect of colour, and the fact that it continues in flower for several weeks greatly increases its value as an ornamental plant. It flowers during July and August. Being a native of Mexico it is not hardy in this country, therefore must have the protection of a frame or cool green-house, or any place where it would be protected, but it dislikes artificial heat, though an abundance of sun-heat is necessary to enable it to ripen its bulbs. The best way to grow it is to pot the bulbs in March, plunge the pot in ashes in a frame protected by a light, and there allow it to remain until it has flowered and perfected its growth, when the bulbs, in pots, may be stored in some dry place during winter. It may be grown successfully on a green-house shelf, the conditions to observe being plenty of light and sunshine and air, and a good supply of water when in full growth.

Bloomeria aurea.—A pretty Californian bulb of slender growth, the stems being from six inches to eighteen inches high, bearing an umbelled cluster of small golden-yellow flowers on slender stalks. It is not a common plant, but is enumerated in nursery catalogues. It may be grown successfully in a warm sunny border of light soil, but it is best to lift the bulbs annually in autumn, and keep them in dry soil or sand till early spring.

Bobartia aurantiaca.—A pretty plant of the Iris family, a native of the Cape of Good Hope. It grows about a foot high, has narrow foliage, and produces on its slender stems a succession of star-like orange-yellow flowers. Being somewhat tender it requires the same treatment recommended for Ixias and bulbs of that class. In southern districts, if planted on rockwork and protected in winter, it has proved tolerably hardy, but it is best when grown in pots or frames.

Bowiea volubilis.—Although an interesting Cape bulb this is by no means attractive, the flowers being very green and inconspicuous; but being almost hardy and of a climbing habit of growth, many may like to grow it against a wall. Planted at the foot of a few dead branches against a wall, so that the stems may twine among them, this plant forms a peculiarly interesting object in a garden.

Bravoa geminiflora (*Scarlet Twin-Flower*).—An extremely pretty Mexican plant, graceful in growth and bright in colour. When well grown, the flower-stems are between two feet and three feet high, and are stout enough to carry themselves erect. All along their upper parts they are thickly hung with scarlet tubular flowers, which are arranged in pairs and prettily droop. In warm and sheltered localities the Bravoa is hardy if planted in light and well-drained soils, but it is advisable to protect the bulbs by ashes or leaves during the winter. Even in places where it is not hardy it is worth growing in pots for the green-house, as it flowers in autumn and lasts a long time in bloom. A group of Bravoas in flower in the open air, forms one of the prettiest sights possible in the autumn garden.

Brevoortia coccinea.—Another name for *Brodiæa coccinea*, chiefly used by American botanists. *B. Ida-Maia* is also a synonym for it.

Brodiæa.—The *Brodiæas*, together with their near allies the *Millas* and *Triteleias*, are pretty Californian bulbs, and most desirable to cultivate, as they possess a beauty peculiar to themselves. For the most part, the *Brodiæas* are quite hardy in this country, provided we endeavour to imitate, as far as practicable, the warm sandy plains of their native land. This we can do in a great measure by selecting the sunniest and driest spots in the garden, and for that matter we can protect them by glass frames; indeed, in some localities this is essential in order to be at all successful with them. As a general rule, however, the *Brodiæas* may be said to be hardy perennials, springing up year after year, and requiring no attention beyond that of keeping them within bounds—for some, such for instance as *B. congesta*, are much given to rambling, and seeds and offshoots spring up around the parent bulbs in all directions, in light warm soil, where they have found a congenial home. The following species are usually known in gardens as *Brodiæas*, but some of the species of *Milla* and the genera *Triteleia* and *Seubertia* are often classed with *Brodiæa*.

B. coccinea.—One of the prettiest and most elegant of hardy bulbs, and, moreover, quite different from all others. Like all the species, it is of slender growth, the leaves being about two feet long when well grown, and the flower-stems grow from two to four feet in height. The blossoms are borne in drooping clusters of from eight to twenty on a stem. They are tubular, about two inches long, of a deep crimson colour tipped with green—a striking contrast of colours. It commences to flower about the end of May, and continues for some weeks. This is a most manageable bulb, not being at all fastidious as to soil so long as it is not heavy. It thrives best in a warm sandy loam in a sunny position. It is seen to the best advantage after it has been established some years, it being one of those bulbs which dislike frequent re-planting. When the bulbs show signs of weakness through exhaustion of the soil or other cause, they should be transplanted to richer soil, and

at the same time the bulblets may be separated for propagation. This should be done about September, after the foliage is matured. In no case should planting be delayed beyond October. This bulb is sometimes called *Breevortia coccinea*.

B. congesta.—A vigorous-growing plant, very soon establishing itself in any light soil, and not unfrequently becoming a weed. It has narrow leaves, and produces, from May to July, numerous slender flower-stems, terminated by a dense cluster of showy purplish-mauve flowers, which remain in perfection for some weeks. There is a white-flowered variety (*alba*) which, however, is rare. This species is perfectly hardy and requires no care if planted in a light soil in a sunny spot. *B. capitata* is a similar plant, but not so desirable.

B. grandiflora.—A beautiful species with flower-stems rising about a foot high, carrying clusters of flowers varying from purple to a pale rose-colour. There is a variety called *major*, which is a larger plant with finer flowers.

B. multiflora.—This is even a showier plant than *B. congesta*, the flowers being larger and the colour, a deep purple-blue, much brighter. The flowers are produced in broad globular clusters on stems shorter than the leaves, which at once distinguishes it from other species. It flowers about the beginning or middle of May. It requires the same treatment as *B. congesta* and *B. grandiflora*.

B. volubilis.—This is a most curious bulb, it being one of the few climbing bulbous plants. The flower-stems possess the climbing tendency, and very often reach from ten to fifteen feet in height, twisting like Scarlet Runner Beans around anything they come in contact with. Therefore it should always be provided with a support, such as a Pea stick or bush, to climb upon. Unless it has some support the plant does not thrive. The stems, which are very brittle, produce dense clusters of flowers at their tops. The blooms are of a bright rose-colour, produced about midsummer. The proper name is *Stropholirion californicum*.

Brunsvigia.—These are South African plants of the Amaryllis family, and numbering about eight species, but only a few of these are at present in gardens. They are all characterised by their large bulbs, broad foliage, and by their flowers being borne in many-flowered umbel-like clusters on stout stems, produced in autumn before the foliage. Being natives of the hot sandy plains of South Africa, they require all the direct sun-heat and light which it is possible to give them in this country. They therefore succeed best when the bulbs are allowed full exposure to the sun and kept dust-dry after the foliage has decayed. Where no special house for bulb culture exists, a good place for the *Brunsvigias*, *Buphanes*, and bulbs of a like description, is on a shelf of an airy and unshaded green-house. Starting from the point, say, when the bulbs are received from the Cape, they should not have a drop of water until either flower-spikes or leaves show indications of springing up. If the bulb contains a flower-spike this will be probably developed if no water is given, but if watered the leaves would appear, and sometimes no flower-spike. Large bulbs of this nature are very apt to decay if care be not taken in watering; if kept without water for half the year they would not only not suffer, but in many cases would be the better for it. If the bulb repeatedly year after year develops foliage instead of flower-spikes, the same course must be pursued of baking it in the sun when resting, and watering freely when in leaf, until the bulb is strong enough to flower. Any light kind of soil will suit these bulbs, so long as it is moderately rich, and open enough to allow of a free percolation of water. They may be increased, but very slowly, by offsets; but, as they are imported direct at a flowering age, home propagation is not worth the trouble. Among the species in cultivation the two best known are:—

B. Josephinæ, producing a huge spreading cluster of many flowers of a reddish-scarlet colour, therefore very showy in flower.

B. multiflora, also a noble plant when in flower, is more scarlet than the preceding. A variety of this species named *minor* is also in cultivation.

Bulbocodium.—One of the earliest of open-air spring flowers is the little *Bulbocodium vernum*, a common plant in old gardens. It much resembles a Crocus or a Colchicum in the form and colour of its blossoms. These expand just before the leaves unfold, one by one, and day after day, until the sheaths, which contain half a dozen flowers, are exhausted. The colour of the flowers is a bright violet-purple, varying in shade in different plants. Such a pretty bulb is therefore indispensable in the spring garden, associated with Snowdrops, early Crocuses, Snowflakes, and others. Being so dwarf, never more than six inches high, it is a capital plant for a sunny spot in the rocky garden, where it would flower sometimes as early as January, while plants grown in the borders, being later, would extend the flowering season for several weeks. It likes a sandy loam best to grow in, and like most other bulbs it prefers being undisturbed for at least three years, but for the purpose of increasing it the bulbs may be taken up and divided and re-planted; as it produces numerous offsets, the produce from one mass is sufficient to re-plant a large space with the bulbs about four inches apart. Bulbs potted in August, and placed in frames,

will produce flowers much earlier than out-of-door bulbs. It is a native of the Alps of Europe, and belongs to the same order as the Colchicum. There is a variegated-leaved form, but it is rare. There is another species, *B. trigynum*, also in gardens, though rarely met with. It is not so desirable, as it flowers when there are hosts of other plants in bloom.

Buphane.—The two or three South African plants comprised in this genus of Lilyworts are unimportant for general cultivation. They have large coated bulbs, which, before the leaves are produced, send up stout flower-stems, terminated by large and dense umbel-like clusters of flowers. These in *B. toxicaria* (the Poison Bulb) are pinkish; in *B. disticha*, flesh-tinted; and in *B. ciliaris*, in which the flowers are more numerous, they are purplish-violet. Culture the same as *Brunsvigia*.

Calliphruria.—The three plants belonging to this genus of the Amaryllis family are so nearly allied to *Eucharis* that some botanists now include them in that genus. In gardens, however, it is convenient to consider the two genera as distinct, for, while the *Eucharises* are all valuable plants, the *Calliphrurias* are comparatively unimportant. All the latter have foliage much resembling that of the *Eucharises*, so similar, indeed, that the plants of the two genera are often confused. The leaves vary in size and form in each of the three species. The flower-stems are produced as in *Eucharis*, but the flowers are different in shape, being much smaller, tubular, and funnel-shaped. The flowers are pure white, and about a dozen are produced on each spike, so that the plants when in flower are pretty. The species are *C. Hartwegiana*, which was the first introduced, *C. edentata*, and *C. subedentata*. These differ but slightly in general appearance from each other. It is one of these species that was put in commerce as *Eucharis candida*, and when not in flower the plants are scarcely distinguishable. The bulbs, however, of *Calliphruria* are more pointed. The *Calliphrurias* require the same treatment as *Eucharis*. All three species are natives of tropical South America, chiefly found in Columbia and New Grenada.

Calliprora lutea.—A Californian Liliaceous plant allied to *Brodiæa*, in which genus it is included by some botanists under the name of *B. ixioides*. It is a neat-growing little plant, having slender flower-stems, averaging about a foot high, terminated by a cluster of starry flowers of a bright yellow striped with brown. Being hardy it may be planted out in a warm border of light soil in a sunny spot, where it propagates itself freely. It is also a pretty plant grown in pots for the green-house. Its pot culture is similar to that recommended for *Ixia*. It flowers in early summer. It is also known under the name of *C. flava*.

Callipsyche aurantiaca. — This is the only cultivated species of the three comprised in this genus of the Amaryllis family. *C. aurantiaca* is rather a handsome plant, having deciduous foliage, and, like the Guernsey Lily, produces its flowers before the leaves are developed. The flower-stem is tall and fleshy, and bears numerous tubular flowers of a warm yellow. It is a near ally of *Phædranassa*, and its flowers somewhat resemble those of that genus. It is a native of tropical America, therefore requires stove culture—plenty of heat and moisture while in active growth, a lower temperature and dryness while the bulbs are resting.

Calochortus (*Mariposa* or *Butterfly Lily*).—Throughout the whole range of bulbs there could not be found more beautiful plants than the *Calochorti*. Exquisitely graceful in growth, possessing flowers both beautiful in form and delicate in colour, they are worthy of the cultivator's best attention. For many years some of the species have been introduced and cultivated, yet they are but little known in ordinary gardens, and the reputation they have long borne of being difficult to cultivate with success has, no doubt, contributed to their neglect. Now, however, that they have been introduced in quantities, and are consequently less expensive, their culture is becoming better understood.

The *Calochorti* are a comparatively new race of garden plants, all the species now in gardens having been introduced within the last fifty years. It was principally owing to the exertions of the Californian botanical traveller, Douglas, that we derived our first knowledge of them, and since his time their introduction has been gradual, until now we have in gardens the majority of the species that are known to botanists. These number some three dozen, with several varieties.

The genus is essentially North American, its headquarters being California, while outlying species reach Mexico, but none are found east of the Rocky Mountains, or north of California. The *Calochorti*, therefore, inhabiting such sunny climes, are but ill-adapted to face our unprotected changeable climate, with its cold and wet winters, and it is on this account that they have the reputation of possessing such delicate constitutions.

The *Calochorti* form such a distinct race of Lilyworts, that they cannot be confused with any other genus. The thirty odd species known are divided now by botanists into two groups, the Cyclobothra group and the Mariposa group. The Cyclobothras

have, until recently, been regarded as a genus distinct from true *Calochortus*, and certainly they are very different in appearance, but as they are by general consent classed under *Calochortus* they will be considered as such here. The Mariposa section all have large open flowers, cup-shaped and erect. In the Cyclobothra section the flowers are smaller than those of the Mariposa species, and the petals are in some species globular in shape on account of the petals being incurved. In nearly all the species the petals are covered on their inner surfaces more or less densely with white hairs, and each petal bears a glandular pit at its base. The leaves of all are narrow and few, and of a silvery hue. The range of colour is not wide, varying only from white to yellow and purple, the prevailing tint being lilac.

Culture.—The complaint that *Calochorti* are difficult to cultivate successfully is general. It is our long sunless and damp winters that prevent us from growing them out of doors, but if we were always favoured with long hot and dry summers, we could grow *Calochorti* to perfection. Hence they cannot be classed with hardy bulbs, although they abhor artificial heat. Frame culture, therefore, must as a rule be followed in this country, for although in favoured localities some cultivators plant the bulbs out in the open border in early spring, and lift them again in August or September for the winter, the practice cannot be generally followed, and as the species vary in degree of hardiness, they cannot be grown successfully under one mode of treatment, but the general principle of culture applies to all. The Californian species are much hardier than those inhabiting Mexico, though the latter are easier to grow, as they may be treated like *Gladioli* and suchlike plants, that is, the bulbs may be planted in spring, lifted in autumn, and stored dry during winter. On the other hand, the Californian kinds must not be kept out of soil during winter. They should be planted in September or not later than October, though they must be kept moderately dry until the bulbs begin to develop leaves about February. A warm, sunny, and thoroughly drained border, with a southerly aspect, must be chosen for them, and provision should be made for protecting the border with glass, in order to throw off the wet, until the leaves appear above the soil in early spring. The most suitable soil is a rich sandy loam, the lighter the better, and the bed should be raised above the general level. This protection is in imitation of their natural conditions, as they are invariably covered with a layer of frozen snow, which protects the bulbs from wet and cold, and when the snow melts in spring the bulbs at once start into active growth. The foliage is not abundant in any of the species, and by the time the flowers appear in June or July the leaves curl up and wither. Most of the species are remarkably floriferous, for every small bulb will develop several flower-stems. The bulbs of the few Mexican species may be planted in March under the same conditions, and lifted, after their foliage and flower-stems are decayed, and stored in dry earth through the winter. After the plants are in active growth they require plenty of moisture about their roots, and all the light possible, so that it is better to allow them to be fully exposed from about March until after the flowering season, when the glass may be put over the border again in order to keep off rains and so induce the thorough ripening of the bulbs before being lifted. When the plants are thriving well annual lifting is needless. The hardiest of all the *Calochorti* is *C. pulchellus*, and this species succeeds admirably when planted at the foot of a warm wall. In such a position it flowers year after year without any attention.

The following species of *Calochortus* (including those belonging to the sub-genus Cyclobothra) are the principal species in cultivation, and procurable in nurseries at prices varying from 2s. to 10s. a dozen bulbs.

C. (*Cyclobothra*) *albus.*—An elegant plant, growing in England about six or nine inches high, but attaining in its native habitat in California as much as three feet high. The flowers are somewhat globular, nodding, and white, and of wax-like texture, produced several together on a branching stem. The variety *paniculatus* is a fine strong-growing variety.

C. (*Cyclobothra*) *Benthamii.*—A very charming little plant, somewhat resembling the preceding, but with narrower leaves and with the flowers nearly erect. These are bright yellow, with the petals, which are half an inch long, deep brown at the inner base and covered with hairs. It inhabits the Sierra Nevada.

C. (*Cyclobothra*) *Bonplandianus.*—This species was cultivated years ago in gardens under the name of *Cyclobothra purpurea*, and is the same as *Calochortus purpureus*. It has a branching stem about a foot high. The flowers are nodding and bell-shaped, with yellowish sepals and purple petals. It is found in Mexico along with another and similar species, *C. fuscus*, also a Cyclobothra, at once recognised by its dull coffee-coloured flowers. *C. Hartwegi* is also a nearly-allied species, having purplish petals with dark veins. All these are natives of Mexico.

C. (*Cyclobothra*) *cæruleus.*—A dwarf slender plant, having a branching stem, carrying from two to five flowers. These are lilac, dotted and lined with blue, and hairy in the interior; called also *Cyclobothra elegans*, *C. cærulea*, and *Calochortus glaucus*. The true *C. elegans* is a similar species, but has greenish-white petals, purplish at the base; and its variety *nanus*, known also as *C. Lyelli*, is a very dwarf and slender

plant inhabiting the Siskiyou mountains of California. *C. Tolmiei* is a stouter and taller plant than *elegans*, and its flowers are more tinged with lilac-purple. It is grown in gardens, but rare.

C. flavus is a Mexican species of the Cyclobothra section, having tall, slender, and branching stems, and smallish, nodding, yellow blossoms.

C. Greenei belongs to the large-flowered or Mariposa section of the genus. It is a very handsome plant, having a stout branching flower-stem about a foot high, carrying from two to five large open flowers, with lilac petals, barred below with yellow, and more or less of purple, and loosely covered interiorly with hairs. It is a rare species in gardens, but may be purchased at nurseries where these bulbs are a speciality. *C. nitidus* is a similar species.

C. Gunnisonii.—One of the Mariposa section, having light lilac flowers, banded and lined with purple. A beautiful species, very rare in cultivation, and native of the Rocky Mountains.

C. lilacinus.—This is the lovely little plant which is known in English gardens under the name of *C. uniflorus*, and it was figured as such in the *Botanical Magazine*, but the true *C. uniflorus* is not yet introduced. *C. lilacinus* bears open cup-shaped flowers, about two inches across, and from four to ten on each branching stem. They are of a delicate soft mauve tint, and hairy interiorly. *C. nudus*, called also *C. elegans subclavatus*, is a similar species.

C. luteus, one of the best known and most beautiful, belongs to the Mariposa section. It has slender stems, bearing from one to six flowers. These are about three inches across, in form like an erect cup, with the three broad petals slightly reflexed. They vary from pale yellow to a deep yellow, and are hairy on the inside, and usually tinged with reddish-brown. In the variety *citrinus* (*C. venustus citrinus* of some botanists) the whole flower is of a deep yellow, with a central circular brown spot, while in the variety *oculatus* the petals are white, lilac, or yellowish, with a similar dark central spot at the base of the petals. *C. clavatus* and *C. aureus* are similar species not yet introduced. *C. luteus* is one of the gems among bulbous plants, and is worth a great deal of trouble to cultivate successfully.

C. macrocarpus.—A rare species of the Mariposa section, having a tall, rigid stem, generally bearing but one flower. This is larger than those of the other species, and of a pale purple-lilac. This delicate tint, combined with the handsome form of the flower, renders it very beautiful.

C. Maweanus.—A small-growing plant, in the way of *C. elegans*. Its dwarf stems are much branched, and bear several small flowers, white or pale lilac, and very hairy interiorly. This pretty little species is often confused in English gardens with *C. elegans*.

C. Nuttallii. — One of the Mariposa or large-flowered group, and extremely handsome. Its stems are slender, about a foot high, and bear from one to five flowers, about three inches across, the petals being white, tinged with yellow or lilac, with a purplish band or spot above the yellow base. It is the same plant as that called in gardens *C. Leitchlinii*, under which name it was figured in the *Botanical Magazine*. It has a wide distribution in California, often occurring as a dwarf Alpine in the Sierra Nevada mountains.

C. (*Cyclobothra*) *pulchellus* is one of the most beautiful, and, at the same time, the hardiest of all the *Calochorti* in cultivation. It is nearly allied to *C. albus*, and was one of the first introduced by the traveller Douglas. Well grown it is a foot or more in height, and the branched stem carries several nodding flowers, globose in form, and of a bright yellow, often a deep orange. The leaves and stem being glaucous-white harmonise beautifully with the golden flowers. This species is so hardy and vigorous as to be quite amenable to border culture in a light sandy soil, which treatment suits it far better than being coddled in pots. It never grows finer than when planted at the foot of a warm wall, where its bulbs can be thoroughly ripened every year. In such a position it comes up year after year, getting stronger and stronger, and never requires to be lifted or even protected during winter. These remarks apply to the climate of London and southward. Northward the plant may in some places need protection. It is so distinct from all the rest that it is not likely to be confused with any other, and it has no synonyms.

C. splendens.—This and *C. venustus* and *C. luteus* are the largest-flowered and showiest species in the genus, and they are now tolerably common in English gardens. *C. splendens* resembles *C. luteus* in manner of growth, as also in the size and form of the flower, but the petals instead of yellow are of a clear lilac, with numerous white hairs scattered over the inner surfaces, and with a densely hairy gland or pit at the base of each. A well-grown plant of the species is about a foot high, and each stem bears several flowers. In gardens it is often confused with *C. venustus*, from which it may be at once distinguished by the absence of the dark blotch at the base of the petals. There is a pure white variety (*albus*), but it is extremely rare in gardens. *C. flexuosus*, a similar, but stouter and taller plant, is so rare that it need scarcely be mentioned. *C. Palmerii*, an allied species, is beautiful, but very rare.

C. venustus is undoubtedly the queen of the genus, and is, fortunately, as easily managed as any of the Mariposas. It has large and exquisitely formed flowers, similar to *C. luteus*. The three broad petals, which assume a cup-like form, with a recurved

rim, vary from pure white to deep lilac. There is, therefore, more diversity of colour in this species than in any other. The original form has pale lilac petals, with a large blotch of reddish-brown near the base of each, and this spot is always bordered with yellow. It is the contrast of the delicate body-colour of the flower with these conspicuous blotches, which renders this species so beautiful. The chief varieties are *albus*, pure white; *brachysepalus*, with shorter petals than the type, less conspicuously spotted; *lilacinus*, of a beautiful deep lilac; *purpurascens*, deep lilac-purple. Other varieties are: Emperor, with large flowers of a deep purple, produced later than the other varieties; *roseus*, an early form, with rose-tinted flowers; and *oculatus*, of a bright purple-rose, with a very deep blotch, almost black. Under the most favourable conditions *C. venustus* may be grown very large, with stems as much as two feet high, and some sorts, such as Emperor, attain even a larger size than that. As a general rule all the Mariposas require frame-culture, as recommended, although in some localities they thrive perfectly in the open,

CALOCHORTUS VENUSTUS.

unprotected even in winter, if the soil is light and well drained.

C. Weedii is the same plant as that illustrated in the *Botanical Magazine* as *C. citrinus*. It is a very beautiful plant, in the way of *luteus*, having large, deep yellow petals, dotted and margined with purple. It may be purchased in bulb nurseries, but is not yet plentiful. A nearly-allied species, also in cultivation, is *C. Kennedyi*. It is a stronger-growing plant than *Weedii*, and has reddish-orange flowers, blotched at the base of the petals with purple.

PROPAGATION.

By W. Watson.

CUTTINGS (continued).

Bedding-plants.—The herbaceous character and free-growing nature of the majority of plants that are used for summer bedding out of doors, renders their propagation easy. Large numbers of plants are required in as short a time as possible, and without the expenditure of much time or labour, and unless a plant is easily propagated, it is of little value in the bedding department. Autumn propagation is preferred for the more robust of these plants, cuttings at that time being both plentiful and vigorous, and the season favourable for the quick production of roots. If the necessary preparation of beds, boxes, frames, and soil has been attended to, the whole of the cuttings may be got in during August and rooted before the approach of cold weather. It may be laid down as a general rule, that all stout, free-growing cuttings prefer a strong loamy soil, whilst those of a more delicate nature, and that have fewer roots, are safest when planted in light sandy soil, containing a large proportion of leaf-mould. Zonal Pelargoniums strike freely at this time of the year, if sturdy, ripe cuttings are placed in beds of light sandy soil, in a semi-sheltered situation. These cuttings should be planted firmly, in rows about six inches apart, and should receive a good watering as soon as planted, after which they will require little attention beyond the removal of dead leaves and a sprinkling of water overhead, should the weather be dry. As soon as rooted, or at least before the approach of cold, wet weather, they should be placed in the boxes, pans, or pots in which they are to winter. For smaller quantities it will be found best to plant the cuttings in shallow boxes, in which they may be allowed to remain until the spring. Calceolarias are generally propagated by means of cuttings placed in frames, the soil in which is made up of equal portions of sand, loam, and leaf-mould, and in these frames they are allowed to remain until the spring, protection from severe frost being given by means of mats or straw.

Pansies, Pentstemons, Phloxes, Pinks, Antirrhinums, and a host of other bedding-plants of robust constitution, may be increased in the autumn in the above way. Boxes thirty inches long, by twelve inches wide, and four inches deep, are most convenient for these purposes. The bottom should be pierced with several holes, an inch or more in diameter, and covered with an inch of ashes or crocks as drainage, the box being then filled up with sandy soil, using loam, leaf-mould, or whatever mixture the nature of the cuttings would require. This subject and that of the next paragraph have been treated in practical detail in Mr. Wildsmith's articles upon The Flower Garden.

Carnations and Picotees.—Where a quantity of these plants are required for use in common bedding, cuttings should be selected in the autumn, and planted in glazed boxes in sandy loam. The portions of the plant most fitted to be chosen as cuttings are the lower lateral shoots, from four inches to six inches in length, which should be pulled rather than cut away from the leading shoot, so that a portion of the ripened wood will remain to form a "heel," which in these plants insures safety in rooting. Plant the cuttings firmly, and keep them almost air-tight until they have rooted. If a position on a warm border is chosen, where only during a few hours in the middle of the day the sun would not shine upon the boxes, the percentage of rooted plants would be large.

A host of herbaceous plants much used in mixed beds or borders, or the front rows in the shrubbery, may be rooted thus, and a good stock of sturdy little plants be got in readiness for spring planting.

Dahlias.—Many of the single kinds of Dahlia are raised from seeds sown in the spring, but for the multiplication of named kinds, and also for the double varieties, either division of the roots is resorted to, or, if a number of each be required, cuttings are procured by treating the old stools as follows:—Early in February or March, the old tuberous roots that were lifted in the autumn and stored in frost-proof quarters should be examined, and a selection made of the kinds of which young plants are required. Prepare a bed in a warm house or propagating-pit, a position under the stage in a stove being, perhaps, the most suitable. Any soil, or even cocoa-nut fibre, will answer to plant the Dahlia-roots in, all that is required being sufficient depth to cover the tubers, and to afford a little nourishment to the new growth. From the base of

last year's stem a number of suckers will be developed, which, when about six inches long, should be cut away, with, if possible, a small portion of the old wood attached, and these, if planted in thumb-pots in sandy soil, and placed in a close propagating-frame, will soon root, after which they may be gradually hardened off, until ready for planting out of doors. A large number of deciduous, tuberous-rooted perennials may be propagated in this way—Hollyhocks, Dichorisandras, Cannas, Begonias, and Erythrinus being some of the most familiar.

All the semi-tropical bedding-plants that need considerable heat in winter are best managed by striking a few strong cuttings of each in the autumn, and relying upon the supply of cuttings these will yield in spring if properly treated. Coleus, Alternantheras, Mesembryanthemums, Iresines, Lobelias, Verbenas, Ageratums, Cupheas, Heliotropes, Salvias, belong to this class. If cuttings are not struck in the autumn, a few of the old plants of each must be lifted from the beds and established in pots, and these, if wintered in a dry house where the frost is excluded, will commence to grow freely in the spring. These spring growths strike freely in a moist, humid atmosphere, and as the cuttings grow, their tops in turn may be taken and made into other cuttings, and so on until the required quantity of plants has been obtained.

Orchids.—The propagation of these plants has hitherto received little attention, owing to the demand for them having been met by the enormous number of imported plants with which the market has been kept supplied. When the localities in which these plants are at present found in more or less abundance become exhausted, we shall be compelled to turn to the propagator's art for our supply of a large number of the kinds. The majority of Orchids, however, can only be increased by means of division and of seeds. Nevertheless the pseudo-bulbs of such species or genera as are long and noded, such as many of the Dendrobiums, Thunias, Epidendrums, and Barkerias, may be multiplied by means of portions of their pseudo-bulbs, upon which latent buds are formed, whilst many others, such as Odontoglossums, Lycastes, Cœlogynes, &c., may be propagated by severing the pseudo-bulbs from the rhizomes, a portion of the latter being left attached to each cutting, and placing them under conditions favourable to the production of roots.

Dendrobiums.—The majority of these plants are characterised by long noded pseudo-bulbs, which resemble bamboo-canes, and along which are developed, first the flowers, and, under certain conditions, these are followed by a number of young plants or suckers, which even in a very early stage of their growth are well furnished with roots. These suckers may be severed from the parent bulb, and planted in the ordinary way. The formation of these offsets is natural to most Dendrobiums, and in some of the species a good number of them are annually produced. The numbers of such offsets may be increased by the removal of the flower-buds before they open. By removing the pseudo-bulbs from the plant, cutting them into lengths of about six inches, and fastening them to a sphagnum-covered raft or block, or placing them on a bed of sphagnum in a close frame, suckers will be produced at almost every node. It will be found a wise plan to remove each sucker from the parent bulb as soon as roots are formed, so that the cutting will not be exhausted before the whole of the buds have vegetated. The practice of cutting away all the old pseudo-bulbs from Dendrobiums after they have flowered, and as soon as the new growths have commenced to grow, is advocated by several successful Orchid cultivators, and whatever the effect of such treatment may have in the production of strong free-flowering growths, it is one which affords an excellent supply of materials for increasing the stock of kinds in the manner above advised; for although the production of suckers is larger when the pseudo-bulbs are not allowed to bear flowers, yet a good supply may be had from them even after they have flowered.

Thunias are increased by cutting up the ripened pseudo-bulbs in lengths with a node each, and planting them in pots of sand, which should be placed on a shelf in a warm house, and kept supplied with sufficient moisture to prevent the cuttings from shrivelling.

Calanthes.—These are propagated by cutting each bulb through the middle transversely, and placing them upon pots of moist sphagnum or silver sand, where they will soon callus and develop several buds round the base of each cutting.

Aerides, Saccolabiums, Angræcums, Vandas, and other Orchids of similar habit, may be increased by removing the leading shoot, and placing it in sand and sphagnum to strike, thereby causing the stem of the plant to push lateral shoots, which may be removed and potted as soon as strong enough.

Anæctochili and many other of the creeping herbaceous Orchids are increased by cutting their stems into as many pieces as there are nodes, and placing them upon sand and sphagnum until they have emitted roots and pushed forth fresh growths.

Phalænopsis are generally multiplied by means of lateral breaks from the bases of old plants. In addition to this, some of them, such as *P. amabilis*, *P. rosea*, *P. Schilleriana*, *and P. Stuartiana*, have the peculiar habit of developing plantlets on the flower-scapes after the flowers have withered, so that if the

plants are sufficiently strong to bear this additional tax on their food-supplying power, the flower-scapes should be allowed to remain on them until the young plants appear. This viviparous character of the flower-spike is found in some of the Odontoglossums, Oncidiums, Epidendrums, and several other genera. Division at the root is, however, the most universally practised of the methods of propagation for these plants, and to this we shall again refer under the section "Division." (See also articles on "Seed-raising" and "Hybridisation.")

Succulents.—The nature of these plants is such as renders their increase by means of cuttings easy. Their skin is so formed that perspiration takes place very slowly through it unless under the influence of powerful stimulants, and when in a young state. This enables them to remain plump and uninjured by long exposure to drought. In the same way when pieces of their stems or branches are removed, these have stored up in their fleshy portions an abundance of food and moisture, which not only keeps the severed parts in health till roots are formed, but contributes to their early formation.

For some of the weaker and more delicate succulents which are found amongst the Cactus group, grafting is sometimes found more suitable than cuttings on their own roots. The Epiphyllums, Rhipsalis, and a few Mamillarias, are of these. Even these are, however, easily increased by means of cuttings in the ordinary way; and, indeed, plants on their own roots, instead of grafted ones, are preferred by some cultivators.

The Cacti order is composed exclusively of succulents, and to the numerous useful garden plants which are included in the genera Phyllocactus, Echinocactus, Cereus, Epiphyllum, Mamillaria, and Opuntia we will turn first. For the branching genera, *i.e.*, Phyllocactus, Epiphyllum, &c., all that is necessary is to remove portions of the shoots, large or small, according as they can be spared, and after allowing their wounds to dry by lying exposed for a day or two, to place them in a moist soil in a warm house. Here they will form roots in a few days. Roots are emitted by cuttings of these plants, even, when left with their bases exposed, if the temperature of the house in which they stand is sufficiently warm and humid. Large branches of these plants root just as readily as small ones, for we have seen branches of Opuntias and Cereus of very large size removed from stems which have become leggy, and after a few days' exposure, planted in soil, when they have rooted without showing the least sign of suffering. "In the lavas at the foot of Ætna," De Candolle observes, "Opuntias are largely multiplied as follows:—As soon as a fissure is perceived, a branch of an Opuntia is stuck in; the latter pushes out roots, which are nourished by the rain that collects round them, or by whatever dust or remains of organic matter may have collected into a little soil. These roots, once developed, insinuate themselves into the most minute crevices, expand, and finally break up the lava into mere fragments."

Those species that possess neither branches nor joints, such as the Echinocactus and Melocactus, are induced to yield cuttings by the following treatment:—Though no branches are formed by these plants, a bud capable of developing into one is enclosed in each of the tufts of spines which clothe the ridges of the stem, and, to compel these buds to grow, the apex of the plant is either cut or burnt so as to check growth at the upper extremity, which causes the latent buds to push and develop into little branches, which when large enough may be removed and treated as cuttings. Early spring is the most favourable season for the performance of the above operations.

All the succulent species of Euphorbia may be increased by means of the methods advised for Cacti; they, too, emit roots quite freely from very large and old cuttings.

The Aloes, Gasterias, Haworthias, Agaves, and Fourcroyas are increased by means of suckers, which are often produced by these plants when old. Many of the species belonging to the first three genera may be multiplied by means of leaf-cuttings, for details of which see chapter on that subject. The flower-stems of Agave and Fourcroya are often proliferous, *i.e.*, produce a number of young plants, which sometimes remain fixed to the flower-stem till roots are formed. It need hardly be said these plants are not the outcome of seeds, but are developed from the stem in much the same manner as in the well-known Bryophyllum.

Mesembryanthemums, Echeverias, Sempervivums, Kleinias, and other popular genera of succulent plants are propagated either from cuttings or by means of leaves. The cuttings strike freely at any time of the year; the most important point to be observed during the callusing and root-forming period, is that of keeping the soil in which the cuttings are planted almost totally dry.

Stapelias have the natural habit of losing their roots and the lower portion of their stems every autumn, whilst in addition to this they have a strong antipathy to moisture during the winter months. For those which lose their roots in a natural way, and also for those that, either through cold or too much moisture, have commenced to decay at the base, the following directions will be found applicable. The whole of the decaying portion of the plants, or branches, should be carefully scraped away, and the healthy portions pegged on to a sandy

dry loam with their bases exposed, not buried. In a warm house where the sun can shine upon them, these stems will emit roots from their sides; afterwards the lateral buds develop and form shoots. For the propagation of Stapelias the spring is most favourable, as at this season after roots have formed the plants make vigorous growth.

Stem-cuttings (Large).—It is often found desirable to shorten the stems of specimen Tree-Ferns, Cycads, Pandanuses, Yuccas, large Aroids, &c., where they have grown too tall, and must therefore either be sacrificed or else reduced in height. For Tree-Ferns all that is necessary is to moss round the stem at the height where it is intended to be cut off, and if a good body of moss is placed there, and kept moist, roots will be formed in time, when the stem may be cut through, and the mossed portion planted in the soil. For such plants as Dicksonia, and some of the Cyatheas, the stems of which are always encased in a thick layer of active roots, the lower portion of the stem may be at once removed, and the top planted in the soil. There is no danger of losing plants thus treated if the house in which they are growing is kept a little moist and warm till the tops have become established. Tree-Ferns are often imported with only the exposed portion of their stems, which have been cut away from the rooted portion and sent on a long voyage; and even after this treatment they seldom fail to grow on being planted out and kept moist. Cycads always root freely, quite as freely as Succulents, so that the thickest stems may be cut through, and the top used as a cutting. Pandanuses being, when large, furnished with aerial or stem roots, may be lowered either at once, or by partly severing the stem, mossing up the stem above the wound, and allowing it thus to remain till roots are formed, when the lower part of the stem may be removed. Yuccas root freely either in water or in a warm moist soil, as also do the large stout-stemmed Aroids, such as Dieffenbachias, Colocasias, &c.

Hardy Trees and Shrubs.—Under this head are included the numerous trees, shrubs, and under-shrubs, both evergreen and deciduous, that are hardy in this country, and for the propagation of which cuttings are often employed. As a general rule all hardy plants may be increased by means of cuttings, which root more or less quickly if placed under favourable conditions. For most of them these conditions are afforded in prepared sheltered borders out of doors, only comparatively few of them requiring artificial warmth to aid them in the formation of roots. Although it is possible to do a great deal without the use of hand-lights or frames, yet it is always as well, at least for choice plants, to supply the cuttings with the extra protection afforded by such means. Many of the plants included here may be increased by means of cuttings at almost any time of the year, but the best results are obtained from cuttings inserted in autumn, with the exception of a few kinds that succeed best in spring. Those portions of plants which are the production of a season's growth are, generally, best fitted to be used as cuttings; and it is in the autumn, when the young shoots are healthy and mature, and filled with the food stored up in their tissues during vigorous growth, that they are in the best condition to form plants when made into cuttings. In deciduous plants the leaves by the autumn will have almost fulfilled their purpose, and will soon fall. Cuttings of such plants, if put in before the fall of the leaf, will have the benefit of the food contained in these leaves, which will return into the cutting, and assist in the development of roots, and also will help to sustain the cutting till it is able to support itself. From this it will be obvious how much better results are likely to be obtained from cuttings formed of leafy shoots than from those the leaves of which had fallen. Evergreens, whose leaves remain on the plant all the winter, and do not as a rule fall off till after another crop of leaves have been formed, are even better favoured when in a cutting state, as the leaves help to support the cutting till roots are formed, and continue to assist in the formation of new growth even after the cuttings have become plants.

It is not intended here to deal at length with the methods of propagation by means of cuttings which are practised for the numerous plants grown out of doors; for the majority of them the same method answers. For Roses and Conifers separate instructions may be necessary, after which the method most suitable for cuttings of nearly all hardy trees and shrubs will perhaps be sufficient to enable any intelligent cultivator to apply it to whatever plants he may desire to increase by this method.

It may be mentioned here that ringing (*i.e.*, the removal of a narrow strip of bark all round that part of the shoot intended to form a cutting) is sometimes found to be an excellent plan to adopt for some plants difficult to increase in the ordinary way. "The accumulated vegetable matter in the callus, which is formed on the upper edge of the ring, when brought into contact with the soil, or any material calculated to excite vegetation, readily breaks into fibres and roots. If a ring be made in the shoot which is to furnish the cutting, a callus will be created, which, if inserted in the ground after the cutting is taken off, will freely emit roots. A ligature would perhaps operate in a similar manner,

though not so efficiently; it should tightly encircle the shoot destined for a cutting, and the latter should be taken off and planted in earth when an accumulation of sap has apparently been produced." *

Roses.—Cuttings of Roses may be rooted at almost any period of the year, and by several different methods; this part of the subject, however, has been fully treated in Vol. I., pp. 210—212.

For the propagation of Roses and other plants requiring a little protection, the Pob-frame, of which a figure is here given, proves most useful, as it is easily fixed over a bed or border, and whilst affording shelter, does not prevent light from reaching the cuttings as mats, straw, &c., do. The term comes from the North of England, where it means spent or refuse flax, over which is placed a few inches of light soil covered by the frame. The "pob" retains its gentle heat, if properly moistened, for months. Stable manure or tan will answer the same purpose. The following is a list of the varieties of Roses which do well raised from cuttings:—

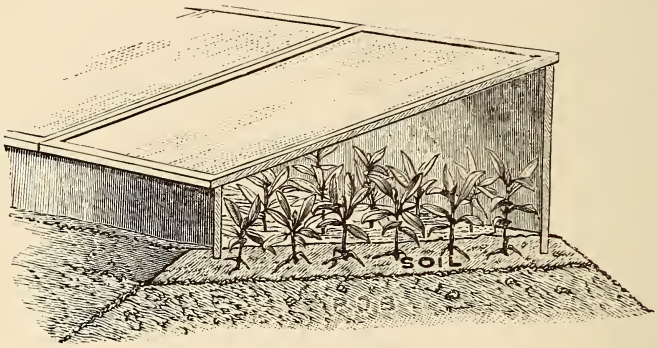


Fig. 14.—Pob-frame.

Abel Carrière.	John Hopper.
Abel Grand.	Jules Margottin.
Alfred Colomb.	La Duchesse de Morny.
Annie Laxton.	La France.
Annie Wood.	Le Havre.
Auguste Rigotard.	Madame Boutin.
Baron A. de Rothschild.	Madame C. Capelet.
Baron Gonella.	Madame Eugénie Verdier.
Baroness Rothschild.	Madame Marie Verdier.
Camille Bernardin.	Madame Thérèse Levet.
Captain Christy.	Madame Victor Verdier.
Charles Lefebvre.	Maréchal Vaillant.
Cheshunt Hybrid.	Marguerite St. Armand.
Comtesse d'Oxford.	Marie Baumann.
Devienne Lamy.	Marie Finger.
Dr. André.	Marie Rady.
Duc de Rohan.	Marquise de Castellane.
Duchesse de Caylus.	Mrs. Baker.
Duchesse de Valombrosa.	Mons. Noman.
Duke of Connaught.	Paul Neron.
Duke of Edinburgh.	Pierre Notting.
Dupuy Jamain.	Prince Camille de Rohan.
Emilie Hausberg.	Princess Mary of Cambridge.
Etienne Levette.	Rev. H. D'Ombrain.
Fisher Holmes.	Sénateur Vaisse.
François Michelon.	Sir G. Wolseley.
General Jacqueminot.	Victor Verdier.
Henri Ledechaux.	

* "Horticultural Transactions."

Teas.

Alba-rosa.	Madame Lambard.
Anna Olivier.	Madame Willermoz.
Catherine Mermet.	Marie Van Houtte.
Devoniensis.	Souvenir d'Elise Varden.
Gloire de Dijon.	Souvenir de Paul Neron.
Madame Camille.	Souvenir d'un Ami.

In addition to the foregoing, the Bourbon, Noisette, and China Roses may be propagated either in pots or under frames in the autumn; these kinds thrive better when on their own roots than when grafted.

Those species of *Rosa* which, owing to the popularity of single-flowered Roses, have attracted considerable attention of late are all capable of being propagated from cuttings inserted in autumn.

For other methods practised for the propagation of Roses, see previous articles, also article on Seeds and Hybridisation.

Conifers.—Cuttings of almost every one of the numerous species and varieties of Coniferous trees and shrubs will strike root if put in any time between August and October, and treated as follows: For the hardier and free-growing kinds, such as *Taxus*, *Thujas*, &c., hand-lights placed over prepared beds of sandy soil afford all the protection necessary for their successful rooting. A position under a hedge or wall, which, whilst affording shade from excessive sunshine, will not darken the cuttings too much, should be selected. Should the soil here be badly drained, it will be advisable to trench it, and after levelling the surface, place upon it a layer about three inches thick of fresh soil, which should consist of loam, peat, and sand, in about equal proportions. Upon this the hand-lights should be placed in rows, with sufficient space between each row to allow a man to move along them, for purposes of watering, &c. Where it is intended to propagate large quantities of these plants, suitable hand-lights or boxes may be made by cutting through obliquely the large cases usually obtained with Dutch bulbs. Each box thus yields two cutting-boxes, the sloping cut sides to form the top of the cutting-box, which should be glazed with strong glass, and, if possible, be made water and air-tight. Beneath these the cuttings

must be planted very firmly, a good watering then given to them, and, after the water has drained from the foliage of the cuttings, the boxes may be placed over them and pressed down a little into the soil. Under the most favourable conditions as regards light, warmth, and rain during the winter, it will be found unnecessary to remove the boxes till the cuttings are rooted and ready to be hardened off. By this means we have seen thousands of Conifers and other hardy trees and shrubs propagated, without the loss of more than five or ten per cent. In dry, sunny weather, it may be advisable to remove the boxes in order to water the soil. Even this may be obviated by watering the soil outside the boxes, which, being very sandy and porous, allows the water to permeate through the whole body of soil, including that in which the cuttings are placed. By the spring these cuttings will have formed roots, and therefore all the further attention they will require previous to being transplanted into pots, beds, or borders, will be a gradual hardening off, till finally the boxes may be removed altogether.

For choicer and less free-rooting kinds, pots are preferable to the open border, and a brick frame or pit of shallow depth affords the most suitable place for them. Eight, ten, or twelve-inch pots may be used, these to be filled with drainage to within about three inches of the top, which space should be filled up by a light sandy soil, half peat, half loam, and pressed in firmly. The cuttings ought not to be put too thick into the pots, say for thickness the leaves just touching each other. After watering, the pots of cuttings may be placed in the frame, which should have a cinder bottom, or better still, a few inches of cocoa-nut fibre or tan in which the pots can be partially buried. Shade the cuttings from bright sunlight; give air on all mild days and nights also; in fact, on mild warm nights, the lights may be removed altogether, as it is found of benefit to the cuttings to allow the dews to fall upon them. Here the cuttings may be allowed to remain, till by signs of new growth it is seen that they are rooted; or to hasten the formation of roots, a hot-bed of dung or tan, or a slightly heated bed in a propagating-house, may be used for the reception of the cuttings after they have callused, or say about six weeks after they were first put in. The extra heat causes the cuttings to strike very readily. Care must be taken not to place the cuttings in a high temperature, or they will be forced into growth before roots have been formed, the effect of which is the using up of the vitality in the cutting, which, under more favourable conditions, would have gone to the formation of roots. A bottom heat of 55° to 60°, with 5° less about the tops, will be found quite high enough for callused cuttings of Coniferous plants.

In the case of many of these plants, the cuttings being hard and often wiry in texture, and also varying somewhat in health, age, &c., they do not strike root simultaneously. It will therefore be necessary to remove the rooted cuttings from the pots, replacing those which are without roots. We have known cuttings to remain callused and healthy for several months without forming roots, although others put into the same pots with them at the beginning had long since struck and been removed.

Cuttings of Conifers vary in size according as the plants are strong or weak, or stout or slender growing. It is therefore difficult to state the exact size to which every cutting should conform. It may be stated, however, that the basal wood of the cuttings should not be more than twelve months old, and never less than a full season. Where possible, a heel should be obtained with each cutting. Being hard, resinous, and often of a more or less fluffy texture, the wood of these plants should be cut with a very sharp knife when intended to form cuttings. The principal cause of failure in the propagation of coniferous cuttings, is damp, which comes through bad ventilation, too much moisture overhead, or the cuttings being too much crowded together. Cuttings of several kinds of Coniferæ are shown at Fig. 15.

The habit of growth of some coniferous trees renders their side-branches of no value for purposes of propagation; for, although cuttings of such parts seldom fail to root, they are quite incapable of forming leads, always retaining the character of a branch, and with a tendency to grow in a horizontal rather than upright direction. In such cases cuttings must be obtained either by taking the leads of the plants, or by pinching out their points, inducing them to push the latent buds of the main shoot or lead, which, when large enough, may be removed and used as cuttings. Those kinds whose branches have a more or less perpendicular habit of growth may be increased by means of cuttings taken from any part of the plant. It is important that the cuttings should be put in fresh from the tree, as if allowed to stand any length of time before they are put into soil (and owing to their not showing signs of suffering from the effects of exposure by flagging as cuttings generally do, there is often danger of neglect in this particular) it is very rarely that they do any good. Where the cuttings are small, it will be well if, after having rooted, they are grown on in pots for the first year or so.

1. Conifers of which cuttings must be obtained from leading growths, lateral shoots being worthless:—

*Abies (including Picea)—Firs, Spruce, Hemlock, and Silver.	*Cedrus—Cedar.
*Araucaria—Chili Pines.	Larix—Larch.
	Pinus—Pine (usually grafted or raised from seeds).

2. Conifers of which cuttings may be taken from any portion of the plant, lateral or otherwise :—

Arthrotaxis — Tasmanian Cypress.
Biota—Chinese Arborvitæ.
*Cephalotaxus — Chinese Yew.
Cryptomeria—Japanese Cedar.
*Cunninghamia.
Cupressus—Cypress.
*Fitzroya—Patagonian Cypress.
*Ginkgo—Maidenhair Tree.
*Glyptostrobus — Chinese Water Pine.
Juniperus—Juniper.
*Libocedrus — Incense Cedar.
*Podocarpus.
*Prumnopitys—Plum-fruited Yew.
Retinospora—Japanese Cypress.
*Saxe-Gothæa — Prince Albert's Yew.
*Sciadopitys — Californian Red-Wood.
Sequoia—Umbrella Pine.
Taxodium—Deciduous Cypress.
Taxus—Yew.
Thuja—Arborvitæ.
*Torreya—Fœtid Yew.
*Wellingtonia — Mammoth Tree.

position before the cuttings are inserted. As a guide in selecting and preparing the cuttings, it may be as well to repeat here what we have already said with regard to the length and age of the shoots most suitable for this purpose. The age of the wood should not exceed a year, the shoots should be healthy, with green leaves upon them, and long enough to admit of their being firmly planted, and to allow several buds and leaves to remain above ground. If possible, without in any way injuring the plants from which cuttings are taken, a heel should be pulled off with each cutting, or sufficient of the previous year's wood be severed with each to form a base to the cuttings. Many common free-

Rooted Cutting of Retinospora.

Rooted Cutting of Thuja.

Cutting of Wellingtonia.

Fig. 15.—Cuttings of Conifers.

Cuttings of those marked with an asterisk require the warmth of a frame and a little bottom heat when callused. The remainder may be propagated under hand-lights or cutting-boxes out of doors.

General Method for Out-door Plants.—Select a sheltered border under either a hedge or wall with a north-west aspect. Should the drainage in this border be defective this must be remedied by removing the soil to a depth of eighteen inches or so, and placing in the bottom a layer of brick rubble, clinkers, or other rough material as drainage. Over this a layer of turfy soil should be placed, the whole to be then filled in with light sandy soil. In preparing the soil for the reception of the cuttings see that it is moist enough to bind well, tread it down firmly, and level the surface. If frames or hand-lights are to be used, these should be placed in rooting plants may have their longest shoots cut in suitable lengths, and planted in the ground without any particular care. Those requiring more attention should be either dibbled into the prepared border about an inch apart in rows, and trodden in firmly, or, if a quantity are to be planted, the soil may be opened out in drills by means of the spade, and the cuttings pressed against the firm side of the drill, and the soil then filled in and pressed down firmly. Water may be given immediately after planting, or, should the soil be already very moist, no water need be given for a time. Generally the rain falls frequently enough to keep the cuttings sufficiently moist. Many soft-wooded, free-growing plants will root in a short time, so that in the following spring they may be removed from the cutting-border and planted in the open. Others, such as Hollies, often take twelve months to form roots. A safe guide to

the proper time to transplant will be found in the growth of the cuttings soon after roots have been formed by them. The beds should be gone over frequently, and all dead leaves and rotten cuttings carefully removed. In very severe weather a little protection may be given to the exposed cuttings by placing over them branches of Yew-trees, mats, &c.; these should be removed as soon as the weather becomes less severe. The cuttings under hand-lights and frames will be much benefited by the removal of the lights or tops of the frames on warm sunny days; in fact they may be always left off or open on all days except when the weather is frosty. For the protection of cuttings, seedlings, &c., out of doors, the *reed-mat protector* shown in Fig. 16 will be found of great service.

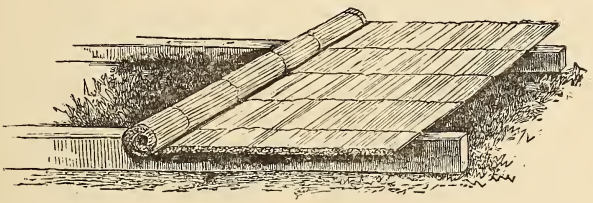


Fig. 16.—Reed-mat Protector.

Cuttings of the Manetti Rose, Paradise Apple, Quince, Wild Cherry, and other plants used as stocks for grafting, are usually rooted by planting them in borders as described above. As these plants are only intended to serve as stems for the reception of buds or grafts of other plants, the lateral buds should be carefully removed from the cuttings before planting them, leaving only two or three buds on the apex of each. The removal of the lower buds is also practised in those cases where suckers are detrimental to the production of flowers or fruit; such plants are Gooseberries, Currants, and some Roses.

Many trees and shrubs may be propagated from large portions of branches planted in the ground. With a few exceptions—such, for instance, as the Willow—this system can, however, be practised only in warmer climates than that of England. It is said that in the South of Europe, where the ground is much warmer than in this country, branches of Apple or Pear-trees of the thickness of a man's wrist are cut into lengths of two or three feet, pointed, and driven into the ground, where they strike root, and soon form strong-stemmed plants. In tropical countries this ready means is employed for the propagation of many of the trees and shrubs which, under artificial cultivation in this country, are only increased by means of small cuttings requiring close care and attention.

The tropical propagating-house is now largely used for the multiplication of numerous hardy plants; especially in nurseries, where it is often desirable to obtain a large stock of particular plants in as short a time as possible. Aucubas, Euonymuses, variegated Ivies, Hydrangeas, variegated Hollies, and even such Conifers as Cupressus, Cryptomeria, &c., are often propagated by the thousand in this way. The cuttings are prepared in the usual way, though smaller pieces may be used for this purpose than are advisable for cool treatment, and are planted in boxes or pans of sandy soil, which are then placed on a heated bed of about 70°, and kept moist by frequent sprinklings of water. Under this treatment roots are rapidly formed, after which the plants are gradually hardened off, till on the approach of summer they are ready for planting in the open border. It is often found a good plan, more especially for new and choice Conifers, to pot the plants of which cuttings are required, and place them in a greenhouse temperature. This induces them to grow quickly, and the small shoots made under these conditions root readily if placed in a warm house, whereas similar shoots taken from plants out of doors would fail to grow.

ORCHIDS.

By William Hugh Gower.

Phalænopsis.—The White Moth Orchid, from *Phalaina*, "a moth," and *opsis*, "like." This is the choicest family perhaps in the whole order, and certainly has proved the most difficult to maintain in a healthy condition for any length of time. They are all epiphytes, originally discovered in the Indian Archipelago, from which all the best species have been obtained. Phalænopsis grow naturally on rocks and trees near the sea-coast, in the Indian Archipelago, *P. amabile* being about the only species found on trees of the inland forests. The islands of the Philippine group appear to be very rich in forms of this queenly genus, and Manilla is often quoted as the native country of many of them; but Manilla is the capital city of the island of Luzon, and the port from whence all the produce of the various islands are shipped, hence it will be seen how erroneous it is to give Manilla as a native *habitat*.

These plants have no pseudo-bulbs, and appear to make but very little stem, even with age, consequently they require strict attention in the matter

of watering, and they must never be allowed to get dry. The sphagnum moss with which they are surrounded should be kept in a growing state, as the least decaying matter that comes in contact with the roots has an injurious effect. Neither do they take kindly to shifting or re-blocking; it will, therefore, be advisable to grow them in the light earthenware hanging-baskets already described, as by this means there is no occasion to disturb their roots, which must happen if they are grown upon blocks of wood or in wooden baskets. They require full exposure to the light, but must not be subjected to the burning rays of the sun, or the result will be blistered leaves; they also enjoy plenty of air, but it must be warm and well charged with moisture. The old flower-stems should not be cut off unless they are dead, for in many instances they make numerous lateral growths, and flower freely, which, with those produced from the new spikes, add considerably to the display. Specimens treated in this manner sometimes bear from fifty to one hundred blooms; besides the extra number of flowers thus obtained, they will often develop young plants from these branching spikes; in this case the spike should be bent down, and the coming plant pegged to the sphagnum, and not separated from the parent until well rooted.

Although Phalænopsis are considered difficult to manage, in most instances their declining health arises from want of care, for no plants will sooner give evidence of neglect. Therefore, to keep their large and handsome leaves in a healthy condition, they must have strict and careful attention; if this is done an abundant supply of flower is sure to follow. East Indian House.

P. amabilis.—Leaves broadly-oblong or elliptic, arranged in a distichous manner, thick and fleshy in texture, and intense deep green in colour, tinged with purple on the under side. Flower-spike drooping, bearing a raceme of many flowers, each measuring some three inches in diameter. Sepals much smaller than the petals, all pure white. Lip white, three-lobed, having a few raised plates at the base, where there are a few streaks of yellow and crimson, the tips lengthened out into two curious twisted tendrils. Spring and early summer. Isle of Luzon, in the neighbourhood of Manilla.

P. grandiflora.—Leaves large, oblong, tapering towards the apex, where they are slightly mucronate, thick and fleshy in texture, colour bright green. The flower-spike is sometimes simple, at other times much branched—these branched stems are usually the previous year's growth, which, if not cut off, frequently live and make fresh shoots, and oftentimes develop young plants. Flowers numerous, twenty to fifty, or even one hundred, according to the vigour of the plant; each upwards of four inches across, pure white, saving a stain of yellow on the front margin of the side lobe of the lip, and the twisted tendrils, into which the tips are lengthened out, are yellow, and not white, as in *P. amabile.* Summer months. Java.

P. grandiflora, var. *aurea.*—The varieties of the species are numerous, but in many instances the distinctions are not sufficient to warrant a name; this plant is, however, an exception to the rule, for it is very much larger, the large rounded petals making a full and almost circular flower; again, the yellow on the side lobes of the lip is deeper, and covers a larger surface, and the twisted tendrils (cirrhi) are deep orange. Summer months. A native of Borneo.

P. intermedia.—Introduced about the year 1850, and sometimes called *P. Lobbii.* Supposed to be a natural hybrid between *P. amabile* and *P. rosea.* Axis of inflorescence deep brownish-purple, bearing flowers half-way in size between *P. amabile* and *rosea.* Sepals pure white, concave, oblong-acute. Petals much larger, lozenge-shaped, acute, pure white, with a few minute speckles at the base. Lip three-lobed, wedge-shaped with rounded angles, violet, with a few crimson spots and dots; the middle division ovate, deep crimson, with the point separated into two short tendrils. Crest nearly square, depressed in the middle, deep yellow with crimson dots. Philippine Islands, neighbourhood of Manilla.

P. Luddemanniana.—Leaves broad, oblong-acute, thick and fleshy, arranged in a two-ranked manner, some six inches long, and bright shining green. The flower-stem very frequently develops young plants. Sepals and petals nearly equal, oblong-acute, ground-colour white, suffused with pale lilac, transversely barred with purple; in some forms these bars are reddish-brown. Lip destitute of tendrils, three-lobed, the middle lobe deep rich violet, the lateral ones and the column white. Spring and summer months. Philippine Islands.

P. Lowii.—A native of British Burmah, and, we believe, the only species from the mainland of India possessing much beauty, the others for the most part being either small and inconspicuous, or dull-flowered. It is said to grow naturally on bare exposed rocks, full in the blazing sun, and that it loses its leaves in the dry season; under cultivation it also becomes deciduous sometimes, and our experience is that in most instances it proves then very hard to wake up again. The plant differs from the other members of the family in the thin texture of its leaves, whilst those of the majority of the species are thick and fleshy, or leathery; then again, it is quite destitute of the peculiar cirrhi to the labellum, whilst the column is lengthened out into a curious rostellum, which, with its two eye-like

spots at the base, resemble the head and beak of a young unfledged pigeon. *P. Lowii* is not only distinct, but extremely handsome, and well deserves general cultivation. Leaves distichous, oblong-acute, dark green, somewhat thin in texture, and some six

it is a splendid form, and as much entitled to specific rank as several others of this genus. Leaves oblong-acute, broad, thick and fleshy in texture, upper side bright green, with a purplish tinge beneath, and about twelve inches in length. Scape sometimes branched

PHALÆNOPSIS INTERMEDIA.

inches long. The flower-stem branching, bearing numerous flowers, some three inches across. Petals three times larger than the sepals, the former broad and rounded, white, suffused with delicate rose. Lip small, without tendrils, rich deep rose, stained with canary-yellow at the base. Summer months. Moulmein.

P. Portei.—This plant is supposed to be a variety of *P. intermedia*, which is considered a natural hybrid; and many-flowered. Sepals and petals pure white, the latter much the largest. Lip three-lobed, side lobes erect, somewhat cuneate, with very blunt points, middle lobe ovate, lateral lobes deep rose, so also is the front lobe, the base part stained with dull orange near the edge, and spotted with dull purple at the very base. Tendrils short, not twisted, but standing forward. Spring and summer months. Philippine Islands.

P. rosea.—This is a small-flowered species, but still a very free bloomer, and very showy. The leaves oblong, notched at the ends, thick and fleshy in texture, and bright green. Scape about a foot or more long, bearing a somewhat lax raceme of ten to fifteen flowers. Sepals and petals equal, spreading, waxy-white, suffused with pink. Lip destitute of the twisted tendrils, middle lobe ovate, deep rose-colour, with a prominent downy callus. Spring and summer months. Philippine Islands.

P. rosea, var. *aurantiaca.*—The present form is so marked, and so showy, that it is deserving of general cultivation. Leaves more ovate than oblong, thick and fleshy. Flowers larger than the normal form, measuring two inches across. Sepals and petals waxy-white, suffused with rich rose. Front part of lip intense deep rose, the basal half, side lobes, and column rich orange. Spring and summer months. Philippine Islands.

P. Sanderiana.—This is supposed to be a natural hybrid between *P. amabilis* and *P. Schilleriana*, and has a somewhat striking resemblance to both. The leaves are more like the first-named species, and yet they are sometimes very slightly tesselated; the shape of the flower is *amabile*, and it retains the twisted tendrils; the side lobes dotted with rosy-crimson at their base. The base of the lip has a peculiar-shaped callus, which is dull yellow, spotted with reddish-brown. Sepals and petals rosy-purple. Spring months. Philippine Islands.

P. Schilleriana.—It is often said that plants with handsomely variegated leaves have small and insignificant flowers, but in the present species we have the beauties of both highly developed. Leaves oblong and obtuse, twelve to eighteen inches long, thick and leathery in texture, dull purple beneath, intense dark green above, over which is spread a beautiful silvery-grey, in some instances disposed in regular transverse bands. Peduncle simple in young plants, but much branched in older specimens, bearing from twenty to one hundred and fifty flowers, upwards of three inches in diameter. Sepals and petals rosy-lilac, the latter much the largest. Lip three-lobed, deep rosy-lilac or purple, with two yellow callosities and a few spots of reddish-purple at the base; middle lobe destitute of tendrils, but ornamented with a pair of short recurved horns. Winter and spring months. Philippine Islands.

P. Stuartiana.—A lovely plant of somewhat recent introduction, and in all probability a variety of the preceding species. Its leaves are slightly mottled, and it has the same recurved buffalo-like horns on the lip. Dorsal sepal and petals white, the lateral sepals stained with yellow all along the inner half, over which is a profusion of dots and spots of purplish-crimson. Lip same colour towards the base, white in front. Winter and spring months. Philippine Islands.

P. Sumatrana.—This is also known by the name of *P. zebrina*. Sepals and petals oblong, upwards of an inch long, creamy-white, tinged with yellow, irregularly barred with transverse blotches of reddish-brown. Lip white, spotted orange towards the base on the side lobes, and streaked with violet in front, where it is densely fringed with long hairs. Spring months. Sumatra.

Physurus.—A large family of small terrestrial plants, which are not conspicuous for their flowers; the species in cultivation are grown for the beauty of their leaves, which somewhat resemble those of *Anæctochilus*, and require the same treatment, which see. Brazilian House.

P. argyreus.—Leaves linear-lanceolate, and bright green, having two silvery lines running parallel with the midrib, the space between them presenting a beautiful frosted appearance. Brazil.

P. fimbrillaris.—Leaves upwards of two inches long, deep green on the upper side, beautifully reticulated with silvery veins. Forests near Rio Janeiro.

P. maculatus.—A somewhat tall-growing plant. Leaves lanceolate-acute, bronzy-green above, with two rows of silvery-white oblong spots on each side of the midrib, from base to apex, the under side plain pale green. Ecuador.

P. nobilis.—A robust plant, with large broadly-ovate leaves, dark green, over which is spread a net-work of bright silvery veins. Brazil.

P. Ortgiesii.—Leaves ovate-lanceolate, deep green, midrib white, and the whole blade freckled with white dots and spots. New Grenada.

P. pictus.—Leaves oblong-acute, the centre of the leaf silvery-white, with a frosted appearance, broadly margined with dark green, over which is spread a net-work of silvery veins. In the variety *reticularis* the leaf is dark green, wholly covered with silvery veins. And in yet another form of this plant the centre of the leaf is silvery-white, with a plain deep green border. Brazil.

Pilumna.—A small genus of beautiful plants. The name is derived from *pileos*, "a cap," in reference to the shape of the singular fringed hood that covers the anthers. They form oblong pseudo-bulbs, which bear a solitary leaf, and should be potted in equal parts of peat and sphagnum moss. They require an abundant supply of water during the period of growth, and even in the resting season water must not be entirely withheld. The same treatment as for Odontoglossums suits them well. Peruvian House.

P. fragrans.—Pseudo-bulbs oblong, compressed, bearing a single leaf, the whole being about a foot high, and dark green. Peduncle pendulous, about as long as the growth, bearing a raceme of four or five flowers, which are delicately fragrant. Sepals and petals long and narrow, more or less twisted, greenish-white. Lip large, spreading in front, the basal part rolled over and enclosing the column, pure white, with a stain of orange-yellow at the base. Winter months. Popayan.

P. fragrans, var. *nobilis.* — In this variety the growth is more robust, and the flowers are much larger in all their parts and very fragrant. Lip large, pure white, bearing a large deep orange spot on the disc. Winter months. Peru.

PROMENÆA ROLLISSONII.

Pleione. — A genus of dwarf deciduous Orchids which have been separated from *Cœlogyne*, distinguished, perhaps, more by their habit than anything else, and dedicated to the Greek Pleione, a water-nymph, in all probability on account of their extreme beauty. Naturally Pleiones clothe the rocks and stems of the forest trees with a rich garland of colours, and in such places the want of foliage is not felt to be a drawback, although it is sometimes urged against their cultivation; but this can be obviated in a very easy manner by planting a small Fern or other plant in their centre before the flowers open. These plants should be potted in loam, peat, leaf-mould, and sphagnum, in about equal parts, the pots should be drained well, and the pseudo-bulbs not elevated above the rim. When making their growth, keep them in the warm house, and supply liberally with water, but do not allow any to stagnate about them. When the thin plaited leaves which have been so brilliantly green are mature, they will soon show signs of decay, and this will be the time to lower the temperature, and put them upon a short supply of water, but do not entirely stop it until the leaves are all off; when this occurs keep them dry until the flowers begin to show themselves. East Indian House while growing, cool end of Brazilian House when at rest and flowering.

P. humilis. — This plant, like all the alpine members of the genus, sheds its leaves before flowering. Pseudo-bulbs flask-shaped, about two inches high, and a dark purplish-green. Peduncle one-flowered, rising above the pseudo-bulbs, and some three inches across. Sepals and petals white, tinged with pale rose in some forms. Lip convolute, spreading in front, where it is deeply fringed, white on the outside, streaked and spotted with crimson and brown, and ornamented throughout with six fringed parallel veins. Winter months. Northern India, at 7,000 to 8,000 feet elevation.

P. humilis, var. *tricolor.* — Pseudo-bulbs ovate, ribbed, dark green. Peduncle supporting one large flower. Sepals and petals soft rose. Lip fringed at the margin, and ornamented with fringed raised veins, white outside, pale yellow within. Winter months. Northern India.

P. lagenaria.—Pseudo-bulbs bottle-shaped, with a flattened top like the lid of a puff-box, deep green,

marbled with brown, and slightly wrinkled. Flowers large, solitary. Sepals and petals equal, pale rose or lilac. Lip rolled over the column at the base, spreading in front, white outside, yellow on the disc, bearing fine parallel crested veins, broadly margined with bands of crimson and yellow, white on the edge, where it is waved. Autumn and winter. Northern India.

P. maculata.—Pseudo-bulbs flattened, narrow at the base, dark green, with a few brown dots. Sepals and petals pure white. Lip rolled over the column at the base, white outside, the disc yellow; the parallel veins are seven in number and fringed; broadly flaked on the margin with vivid crimson. Autumn months. Northern India.

P. præcox.—Pseudo-bulbs top-shaped, with a raised centre, dark green, spotted with reddish-crimson. Flowers large, of a uniform bright rose, crested on the disc, and deeply toothed at the edges. Winter and spring months. Northern India.

P. Reichenbachiana.—Pseudo-bulbs large, flask-shaped, deep green, covered with a beautiful network of brown, and profusely spotted with the same colour. Peduncle usually two-flowered. Sepals and petals bright rose or rosy-lilac. Lip white or bright rose suffused with purple, disc blotched and streaked with purple, in some forms crimson, with three fringed crests along the centre. Autumn months. British Burmah.

P. Schilleriana.—This plant differs from all the preceding in producing the flowers with the leaves. Pseudo-bulbs very small, flask-shaped, bearing a pair of lanceolate leaves, from between which the single-flowered peduncle arises. Sepals and petals tawny-yellow. Lip large, three-lobed, side lobes small, erect, not covering the column, white; middle lobe large and spreading, lacerated and toothed at the edges, the disc bearing three elevated ridges, dull orange, blotched and spotted with brown. Summer months. British Burmah.

P. Wallichianum.—Pseudo-bulbs top-shaped, beautifully spotted and netted reddish-crimson. Flowers solitary, large and fragrant, bright rose. The centre of the lip yellowish-white, striped with pure white, crested and deeply toothed on the edge. Winter and spring months. Northern India.

Promenæa.—This genus comprises a few small-growing plants, which have been separated from *Maxillaria*. They are all low-growing, seldom exceeding four inches in height, and should be planted in shallow hanging baskets, in rough peat. In the growing season water freely, but dry them moderately when at rest. Brazilian House.

P. citrina.—Pseudo-bulbs oblong, clustered, bearing a pair of thin, pale green leaves. Peduncle radical, one-flowered. Sepals and petals spreading, of a uniform deep rich yellow. Lip yellow, spotted with crimson at the base. Autumn months. Brazil.

P. Rollissonii.—A somewhat stronger-growing species than the preceding. The flowers, which are pale yellow, destitute of spots, are also larger. Autumn months. Brazil.

P. Stapelioides.—Pseudo-bulbs ovate, bearing a pair of thin, pale green leaves. Peduncle bearing a solitary large flower. Sepals and petals greenish-yellow, spotted and transversely barred with deep purple. Lip small, and very dark purplish-black. Autumn months. Brazil.

Renanthera.—These are very handsome epiphytes, with large distichous leaves and long racemes of showy flowers. The name comes from *ren*, "a kidney," and refers to the reniform shape of the anthers. They are nearly allied to *Vanda*, from which they are distinguished by their jointed labellum, and the spur being on the middle and not at the end. Renantheras require great heat and moisture, and should be grown in pots with sphagnum moss, and kept in the warmest part of the East Indian House.

R. coccinea.—A rather straggling plant, which succeeds well trained upon the roof, where it can be fully exposed to the sun. The leaves are rather short, oblong, and notched at the apex. The peduncle is branched and bears a great number of flowers, which are about two inches across. Dorsal sepals and petals about equal, deep red, suffused with orange; lateral sepals larger, and deep rich scarlet. Lip small, rich crimson, white at the base. This plant is a very shy bloomer, and during the winter months should be kept quite dry unless it shows signs of exhaustion. Summer months. Cochin China.

R. Lowii.—This is one of the most remarkable plants in the whole of the Orchid family. It grows to a great height, with a thick stem, on which the large strap-shaped leaves are arranged in a two-ranked manner; these measure from one to three feet in length, smooth above, carinate beneath, and deep green. The flower-spike is pendulous, thickly clothed with short hairs, attaining a length of from three to six, and (in strong and vigorous specimens) even twelve feet, bearing as many as fifty flowers, and plants have borne as many as six of these gigantic racemes at one time in this country. A peculiarity of *R. Lowii* is the production of two kinds of flowers on one spike; the two basal ones, that is the pair next the leaves, differ somewhat in shape and altogether in colour. Sepals and petals in the basal flowers thick and fleshy, spreading, broad and obtuse, with plain edges, and nearly equal in size, colour tawny-yellow,

profusely spotted with reddish-crimson. Sepals and petals in the other flowers much longer, lanceolate-acute, with waved edges, ground-colour in front yellowish-green, nearly covered with large blotches of reddish-brown, yellowish-white on the outside. Lip very small, with a small beak in front. Summer and autumn months. Humid forests in Borneo.

R. matutina.—This has both beautiful and singular flowers, for it does not require much imagination to liken them to the harlequin in a Christmas pantomime. Leaves somewhat distant, narrow strap-shaped, notched at the ends, deep green. Raceme simple or panicled, bearing numerous flowers of extraordinary shape, bright scarlet, spotted and barred with brown. Autumn months. Java.

Restrepia.—A genus of small epiphytes, with but few characters to distinguish them from their near allies the *Pleurothallis*. They have slender stems, which bear a single leaf, from the base of which their curious flowers are produced. These plants will succeed best in earthenware hanging baskets, in peat and sphagnum, and should never be dry. Peruvian House.

R. antennifera.—This is the finest species yet introduced; whole plant about six inches high, stems slender, bearing a single broadly-ovate, coriaceous, dark green leaf. Peduncle one-flowered, the flower being large and exceedingly curious. Dorsal sepals long and narrow, yellowish-white, streaked with dull purple; lower sepals large and broad, and joined together to within a short distance of the points, presenting the appearance of a large lip, ground-colour deep reddish-crimson, thickly studded with purplish-black dots. Petals small and narrow, clubbed at the ends like the antennæ of a butterfly. Lip small, same colour as the lateral sepals. Spring and summer months. Columbia.

R. elegans.—Whole plant about three inches high, leaves exactly oval, coriaceous, and deep green. Flowers small, yellow, ornamented with regular lines of purple spots. Petals antennæ-like. It is almost a perpetual bloomer. Mountains of Venezuela.

R. Lansbergii.—Whole plant about four inches high. Flowers golden-yellow, ornamented with irregular purple spots. Summer months. Guatemala and Caraccas.

R. vittata.—Plant about four inches high. Leaves oblong-obtuse, dark green. Sepals and petals white, spotted with bright rose. Lip yellow, striped with rose. Summer months. Columbia.

Rodriguezia.—A small genus of epiphytes, named in honour of Emmanuel Rodriguez, a Spanish physician and botanist. They are dwarf plants, and should be grown in shallow hanging baskets, in peat and sphagnum moss. Water freely when growing, and give them a season of rest with a short drying. Brazilian House.

R. secunda.—Leaves thin, plicate. Scape six to nine inches or more long, bearing a one-sided (*secund*) raceme of bright red flowers, which are very pellucid. It blooms during autumn and winter, lasting long in beauty. West Indies.

R. suaveolens.—This is not a showy species, but it deserves a place in every collection for its delicious perfume. Pseudo-bulbs oblong compressed, and, together with the leaves, pale green. Raceme dense, flowers of a uniform light straw-colour. Winter and spring months. Brazil.

Saccolabium.—This genus of beautiful epiphytes derives its name from *saccus*, "a bag," on account of the curious pouch of the labellum. They are all natives of India and the Indian Islands. Saccolabiums take rank amongst the very finest members of the order; their stems are closely furnished with leathery strap-shaped leaves, arranged in a distichous manner, from the axils of which the flower-spike proceeds; and although the individual flowers are not large, they are produced in very long and dense racemes, rendering them conspicuous.

These plants require to be kept in strong heat and moisture, and to be very carefully treated during the resting season, if they are to retain their symmetrical appearance, for, although they undoubtedly do get a severe shrivelling in a state of nature, it does not improve their appearance from a cultivator's point of view, for shrivelling of the foliage means their destruction in many instances, and disfigurement of the plant, and consequently loss of value: therefore, in resting Saccolabiums, do not dry them sufficiently to exhaust the fleshy leaves. They should be grown in living sphagnum and nodules of charcoal. The large-growing kinds require pot culture, but the smaller ones (and there are numerous very beautiful miniature species) thrive well in small earthenware hanging baskets. East Indian House.

S. ampullaceum.—A small-growing species, with straight, strap-shaped, two-ranked leaves, some six inches long, and deep green. The scape erect, bearing a dense raceme of bright rose-coloured flowers, which last long in beauty. There are several varieties, the finest being *Moulmeinense*, a form from British Burmah, which is a stronger grower. Leaves spotted near the base with brown; the racemes are longer, and the flowers are larger and more intense in colour. Spring months. Sylhet and Sikkim.

S. Blumei.—Leaves long, distichous, mucronate at the apex, and pale green, with several veins of darker green running through their entire length.

Racemes long, pendulous, and very dense, having the appearance of a fox's brush. The flowers are waxy-white, dotted with violet. Lip small, rich violet. The var. *majus* produces very long racemes, and large flowers; other forms are *Dayi*, *Russellianus*, *splendens*, &c. &c. Summer and autumn months. Java and the Philippine Islands.

S. curvifolium.—Leaves thick and coriaceous, narrowly strap-shaped, some ten inches long, and pale green. Raceme erect, dense, rather shorter than the leaves. Flowers rich orange-scarlet in colour. There is a var. *luteum*, in which the flowers are a plain rich yellow. Spring months. British Burmah.

S. giganteum.—As its name implies, this is a large growing plant; leaves broadly ligulate, thick and fleshy, erose at the apex, about twelve inches long and three broad, deep green. Racemes pendulous, as long or longer than the leaves. Flowers large (for the genus), and supported upon long foot-stalks, which give the whole raceme a very thick tail-like appearance. Sepals and petals waxy-white, the latter slightly spotted with lilac. Lip violet, shading to lilac. Flowers very fragrant, lasting long in perfection. British Burmah.

Saccolabium Guttatum.

S. guttatum.—Leaves lorate, channelled, thick and fleshy in texture, truncate at the apex, about a foot long, and deep green. Racemes twelve to eighteen inches long, cylindrical, and dense. Flowers waxy-white, spotted and dotted with purple. There are several varieties, the differences being chiefly the intensity of colour in the flowers. Summer months. Various parts of India and Java.

S. guttatum, var. *Holfordianum.*—This is such a grand form of the species that it must not be omitted in this enumeration; indeed, it may, with justice, be considered the finest of the section, which includes *Blumei*, *guttatum*, *retusum*, and *præmorsum*. Leaves broadly strap-shaped, channelled, thick and leathery in texture, erose at the apex, about eighteen inches long, and slightly recurved. Racemes pendulous, cylindrical, dense, and longer than the leaves. Sepals and petals white, thickly spotted with rosy-purple. Lip small, rich deep crimson. Spring and summer. Java.

S. Harrisonianum.—Leaves broadly strap-shaped, channelled, bifid at the apex, and pale green, with streaks of a darker green running parallel from base to point. Racemes pendulous, cylindrical, dense, one to two feet in length. Flowers pure white, and very fragrant. Winter months. Island of Pulo Copang.

S. Hendersonianum.—Leaves ligulate and slightly pointed, coriaceous, some six inches long, and deep green. Raceme erect, as long as the leaves, and densely set with bright rose-coloured flowers, except the narrow lip, which is white. Spring months. Borneo.

S. miniatum.—A small species, but extremely handsome. Leaves short and straight, lorate, obliqely truncate at the apex, and deep green. Raceme equal in length to the leaves, erect, and densely set with bright vermilion-coloured flowers. Spring months. Java.

S. præmorsum.—This is a fine robust-growing plant of the *guttatum* section; its leaves are much broader than in the last-named plant, and the ends of the leaves appear to be roughly bitten off. Raceme very thick and dense, a foot or more long. Flowers waxy-white, sparingly dotted with lilac. Spring and summer months. Western Ghauts of South Hindoostan.

S. retusum.—A bold and free-growing species, producing long cylindrical racemes of flowers, which are waxy-white, profusely spotted with pink. The racemes are not so long as in the other forms of this section. Early spring months. Assam.

S. violaceum.—The leaves of this species are very broad and stout, strap-shaped, bi-lobed at the ends, upwards of a foot long, and deep green, traversed by several parallel lines of a still deeper hue. Raceme

longer than the leaves, cylindrical and dense. Flowers set on rather long foot-stalks. Sepals and petals pure white, profusely spotted with bluish-lilac. Lip fiddle-shaped, rich deep rosy-violet, and marked with five raised lines on the crest. Winter months. Philippine Islands.

TREES AND SHRUBS.

By George Nicholson.

Arbutus.—There are about ten species of *Arbutus*, only two or three of which can be placed in a list of hardy shrubs, and even the Strawberry-tree of Killarney, &c. (*A. Unedo*), often gets killed during severe winters even in the South of England. As, however, it is a rapid-growing and very ornamental evergreen, either with or without flowers and fruit, it is worth planting in other places than favoured spots along the south coast. There are several varieties, one of the best of all being *A. U. rubra*, with handsome reddish flowers. This must be propagated either by layering or grafting on the type. *A. Andrachne* is a larger species from the Levant, with deciduous reddish bark peeling off the branches in large flakes. The white flowers are borne in large panicles. In many places this, which is larger in all its parts than *A. Unedo*, is hardier than that species, with which it hybridises freely, several plants more or less intermediate in general character between the two being in cultivation. *A. procera* is a North American plant nearly allied to *A. Andrachne*. All the *Arbutus*, like most of the *Ericaceæ*, thrive best in a peaty soil.

Arctostaphylos.—This is a small genus of handsome evergreen shrubs, belonging to the same order and requiring the same treatment as the last-named. In the British flora it is represented by two species, one of which, the Bearberry (*A. Uva-ursi*), a pretty trailer, is worth a place in the front of any peat border. *A. tomentosa* and *A. pungens* are two erect much-branched North American shrubs, with pure white flowers. Neither of them is so hardy as the Bearberry, although they have grown and flowered freely for many years in places where some so-called hardy shrubs have suffered from the severity of unfavourable winters.

Arundo.—The only member of this genus of Grasses which is woody, and at the same time fairly hardy, is the South European *A. Donax*, a handsome plant for the margin of ornamental water. It grows in dense tufts, and has long narrow gracefully-curling leaves, and tall stems, a dozen feet or so in height. These latter are used for making fishing-rods, and also musical instruments, &c. The variegated form is a desirable foliage plant, but is not so hardy as the common green-leaved one.

Atriplex.—Most of the members of this genus, which contains some fifty or sixty species of *Chenopodiaceæ*, are worthless as garden plants. *A. Halimus*, however, is an interesting shrub, with stalked ovate-oblong entire leaves, clothed, as well as the twigs, with a grey scaly indumentum. It is a native of the sea-coasts of the Mediterranean region, and along the southern coast of England, &c., it makes one of the best of sea-side shrubs, and grows freely in spots where most shrubby vegetation would not thrive at all.

Aucuba.—Since the introduction of the male plant of *A. Japonica* by Fortune many years ago, a large number of seedling forms of this extremely popular and useful shrub have sprung into existence. So numerous are the named varieties that it is hardly worth while mentioning them in detail. There are green and variegated forms of both sexes, and all that is necessary to secure a fine crop of bright red oblong berries is to plant one or more male plants anywhere near the female ones. Of course, conveying the pollen from the male plant to the female by means of a camel's-hair brush renders fertilisation, perhaps, more certain than if left to the agency of insects or wind; but a few male plants dotted here and there will in practice be found to secure the due fertilisation of females within a considerable radius, without artificial aid of any kind. *A. Himalaica* differs principally from its Japanese relative in the ample, dark green, long-stalked leaves, and spherical, not oblong, berries.

Azalea.— In the spring months no hardy shrubs afford a more brilliant display of varied colour than the so-called Ghent Azaleas, which are in reality garden hybrids between the Oriental *A. Pontica* and the North American *A. calendulacea*, *A. nudiflora*, *A. viscosa*, &c. These hybridise and intercross with each other freely, and now some of the varieties of more recent strains are much superior to the wild types in colour, beautiful as these are. Another great advantage, too, which they possess over the older seedlings of the *nudiflora* type is the presence of well-developed leaves, produced contemporaneously with the flowers, which are much showier in their setting of green than on bare leafless twigs. Many double-flowered forms, too, of the set about which we have just spoken have been raised of late, and these last, as a rule, some days longer in full beauty than the best of the single ones. All the Azaleas here mentioned must have a peaty soil, and they by no means

object to a liberal mulching of rotten dung, decayed leaves, &c. Finer growth and a greater profusion of flowers will be produced by plants that are well looked after in the way of food.

A. amœna.—In the South and West of England this handsome little Chinese shrub thrives admirably in the open air, and produces in great profusion rich crimson, almost bell-shaped, hose-in-hose flowers. Hybrids, too, have been raised between this species and *A. Indica.*

A. balsaminæflora is a neat dwarf-growing Japanese bush, having double rosette-like salmon-red flowers. This, although cultivated generally as a pot plant, is hardy enough in the South, and probably in other parts of England.

A. calendulacea.—Even in a wild state this North American species varies much. Its flowers range from yellow and red to orange and copper-colour.

A. nudiflora flowers on the leafless twigs in May. There are varieties and hybrids of almost all shades of red, yellow, white, &c. Like the last-named, this hails from North America.

A. Pontica, the Oriental species, has soft hairy leaves, and bright yellow or orange flowers.

A. Sinensis, perhaps better known under the name of *A. mollis*, is a species from China and Japan, with large bell-shaped flame-coloured flowers. A host of forms of this are now grown by specialists, and all very beautiful for conservatory decoration. They are hardy enough for open-air decoration, but the flowers seem more liable to be damaged by spring frosts than do those of most of the other kinds.

A. viscosa has long, clammy, tubular, sweet-scented white flowers, produced a month or so later than those of the *nudiflora* section. The type is a very pretty shrub, and there are numerous hybrid or seedling forms derived from it, both double and single, which are very useful and ornamental.

Azara.—Very few members of the order *Bixineæ* are hardy enough to be cultivated in the open air in Britain. The genus *Azara* is an exception, and *A. microphylla* is one of the prettiest and most graceful of small-leaved evergreens. As a wall plant it makes an elegant subject, as also do *A. integrifolia* and its variegated form. These latter have much showier and larger flowers, too, than the first-named. *A. Gilliesii* has large, bright yellow, axillary inflorescences, and is, as far as flowers are concerned, the finest species in cultivation. It has large, Holly-like, leathery leaves, and is very different in aspect from either of the other species. All are now and then likely to succumb during a severe winter; but, as they are readily propagated by cuttings, and grow rapidly, a reserve plant can always be sheltered in a cold frame. All are natives of Chili.

Baccharis (*the Groundsel Trees*).—The genus *Baccharis* is rather a large one, but of the arborescent species probably only two are in cultivation. They do well in open spots in rather dry soil, and flourish near the sea, where many other shrubs will not succeed. *B. halimifolia*, a native of the Eastern United States, makes a large bush some ten or twelve feet in height, and as much through; it has obovate or oblong wedge-shaped leaves and angled branches, the whole plant being covered with a whitish powder. The female plant (the species is dioecious) is the handsomer of the two on account of its conspicuous silvery pappus; the male has yellowish pappus, and for this reason was called *B. lutescens* by those who at one time believed it represented a distinct species. *B. Patagonica* is a more compact dwarf grower, a thoroughly desirable bush for a small shrubbery.

Bambusa.—Of this genus there are some quarter of a hundred species well known, and probably many others which have not yet been botanically determined. With the exception of a single New World species, all are natives of the tropical and sub-tropical regions of Asia. Those which are hardy enough to withstand the rigours of British winters, hail mostly from China and Japan. In the South of England they thrive admirably in sheltered spots, and make beautiful objects if planted in fairly rich ground and kept abundantly supplied with water at the roots.

B. aurea has slender, much-branched stems, six to ten feet high, with linear-lanceolate acute, light green leaves. It is a native of China. *B. Fortunei* is a very dwarf, densely-tufted species from Japan, and rarely attains more than two feet in height; the variegated form is much the more common. *B. Japonica* (the correct name of which is *Arundinaria Metake*) has dark green, lanceolate, shortly-stalked leaves, and attains a height of four or six feet. *B. nigra* owes its name to its glossy purplish or blackish stems. It is a dwarf-growing species from China and Japan, whose proper name is now *Phyllostachys nigra.* *B. Ragamowski*, also from China and Japan, has large, dark green leaves, and forms a fine mass when planted on the margin of a piece of water; it only grows from four to six feet high. *B. Simonii*, another species from the same botanical region as the last-named, is a quick-growing plant, with long narrow leaves, and stems which attain a height in this country of ten feet, glaucous at the joints. The above-mentioned are the best for general cultivation; none of the enormous species which form such striking features in tropical jungles are hardy enough to grow in the open air in Britain.

Benthamia fragifera is now generally included

under *Cornus*, but as it is better known under the name here given, that is retained for convenience. It is only in the South-west that this wonderfully handsome Himalayan shrub succeeds thoroughly in the open air in Britain; when laden with its large red fruits it presents an aspect quite unlike that of any other occupant of a place in English shrubberies.

Berberis.—About a hundred different so-called species of *Berberis* are described in books, but very probably not more than half that number are really distinct. They are widely distributed throughout Europe, Asia, and America. Scarcely more than a dozen are worthy of general cultivation, but amongst these are some of the most useful as well as the most beautiful of hardy ornamental shrubs. The genus may be divided into two sections, the one with pinnate leaves—formerly classed under the generic name *Mahonia*—the other with simple, usually clustered leaves.

SPECIES WITH PINNATE LEAVES.

B. aquifolium, the best-known member of this section, is a charming plant at all times; its dark green, leathery, evergreen foliage forms a fine setting for the clustered racemes of yellow flowers, as well as for the purplish glaucous fruits which succeed them. It is one of the best shrubs for growing under tall trees, and makes a fine cover for game in woods. *M. fascicularis* is a taller, more shrubby species, a profuse flowerer, and a desirable plant for any shrubbery border. *B. Japonica* has large handsome greyish green, very rigid, spiny leaves, and generally unbranched stems. *B. Bealii* and *B. intermedia* are mere seminal variations, differing slightly in the outline of the leaflets. *B. nervosa* is a dwarf grower, suitable for rockery or for planting on a sunny bank, and *B. repens* in general aspect resembles a reduced form of *B. aquifolium*. All the foregoing—with the exception of *B. Japonica*, which hails from China and Japan—are North American.

SPECIES WITH SIMPLE LEAVES.

B. buxifolia, formerly generally known under the name of *B. dulcis*, has large, solitary, long-stalked flowers, and oval, dark green, Box-like leaves; it is a native of the southern parts of South America, and grows about six or eight feet high under favourable conditions. The variety *nana* is a compact and dense-growing dwarf form, hardly exceeding a foot in height. *B. Darwinii*, with its orange-yellow flowers, and small, glossy dark green, spiny-toothed leaves, is also a Chilian plant, and one worthy to commemorate the great naturalist whose name it bears. A hybrid between this and the next-named species (*B. stenophylla*) is intermediate in general characters between the two, and not less handsome than *B. Darwinii*. *B. empetrifolia* is a dwarf grower, with narrow, dark green leaves, with the margins strongly revolute, and few-flowered clusters of slender flowers not nearly so bright or showy as either of those of the two last-named plants. *B. Sinensis* is not unlike the common Barberry in leaf and flower characters, but infinitely more graceful in habit, and apparently quite as hardy. Either in fruit or flower this is the best of the sub-section, of which the common Barberry may be looked upon as the type. *B. vulgaris* is hardly showy enough to be much planted for ornament, although when laden with its orange-scarlet fruits few shrubs present a more beautiful appearance; some of the forms, however, are distinctly desirable, one with purple leaves being among the most distinct and striking *foliage* shrubs; those with white, yellow, and scarlet fruits, too, are both interesting and ornamental.

All the Berberises are readily raised from seed, and succeed under very varied conditions as regards soil and situation.

Betula (*Birch*).—There are about twenty-five species of Birch, most of which inhabit North Temperate and Arctic regions. No more graceful tree exists than our native *B. alba*, with its silvery bark and slender branches. A considerable number of garden forms are cultivated, and one or two geographical varieties, the best of which are mentioned here. The variety *Dalecarlica* has beautifully-cut leaves, with the habit of the common wild British Birch; *fastigiata*, with the leaves of *B. alba*, has an erect habit of growth, the counterpart of that of the Lombardy Poplar; *foliis purpureis* only differs in its distinctly purplish leaves; *pendula* is amongst the most beautiful of all weeping trees; the sub-variety *Youngii* is a form with more decidedly pendulous branches, and *populifolia*, with larger, more Poplar-like leaves, is the North American representative of the British species. *B. lenta*, *B. lutea*, *B. nigra*, and *B. papyrifera* are species from the North-eastern United States, quite hardy in this country, and thoroughly worth growing in an English park; not one of them, however, is nearly so effective in the landscape as *B. alba*, if we partially except the Red or River Birch, *B. nigra*, which in winter is conspicuous enough by reason of its reddish bark peeling off the branches and trunk—to which it remains for a long time loosely attached—in long strips or flakes. *B. nana* is a denizen of Arctic and Alpine regions throughout the Northern Hemisphere; in Britain it only occurs from Northumberland northwards. It is a pretty little bush, with small, round, crenated leaves, and rarely attains a height of three feet. Grafted as a standard on *B. alba*, it makes a nice shrubbery plant; on its own roots it is best placed on the rockery.

All the Birches are readily raised from seed, and the varieties which do not come true when propagated in this way can be grafted on *B. alba*.

Broussonetia papyrifera is the only species of the genus *Broussonetia* which is worthy of mention here; it is the Paper Mulberry of China and Japan, and from an economical standpoint a very important tree, as from its inner bark is manufactured excellent paper in the countries just named, and in the South Sea Islands an exceedingly tough cloth. In the South of England, at any rate, it is perfectly hardy and should be more largely grown. In France the trees attain a considerable size, and the long brown catkins of male flowers present a novel appearance in May and June; the shorter female catkins are different in colour and are borne on different trees.

Buddleia.—The only members of this large genus which can lay claim to be considered fairly hardy, and at the same time are worthy of general cultivation, are the Chilian *B. globosa* and the Chinese *B. Lindleyana*. The former has small bright orange flowers, arranged in globular long-stalked heads, and the latter purplish-red hairy tubular flowers, in long terminal racemes. *B. globosa* attains a height in two or three years of eight or ten feet, and *B. Lindleyana* hardly grows more than half that height. Neither can be depended upon, except in favoured situations; but they are so readily propagated by cuttings, and grow so fast, that they are worthy of a sheltered place in the shrubbery, or of the protection of a wall, in any garden where ornamental shrubs are grown.

Buxus (*Box*).—Of the score or so species of Box only a couple are worthy of mention here; but one of them, our native *B. sempervirens*, is one of the most deservedly popular of all hardy evergreens; there are numerous garden varieties, exhibiting a very considerable range of differences in habit and leaf characters. The form usually cultivated for Box-edgings is *suffruticosa; rosmarinifolia* is a dwarf bush with small Rosemary-like leaves; *arborescens*, a stout, tall-growing variety; and *angustifolia*, *bullata*, *glauca*, *marginata*, *argentea*, *obcordata*, and *rotundifolia* have names sufficiently descriptive to render further remarks concerning them unnecessary. *B. Balearica*, a native of the Balearic Islands, has larger yellowish-green, leathery leaves, and is a more robust grower than *B. sempervirens* or any of its varieties.

Calluna.—*C. vulgaris* (the Common Ling), the only species of this genus, is so well known that description is unnecessary; it covers vast tracts of moorland in this country, and is also found throughout Europe (except Greece and Turkey), in West Siberia, Greenland, and (rarely) in North-east America. Some of the garden varieties are very desirable plants for the peat border; they vary exceedingly in the colour of the flowers and in the general habit of growth. Amongst the best are *Alportii* and *Serlii*, two robust-growing, free-flowering white kinds; *dumosa*, which forms very dense hemispherical cushion-like masses; *dumosa aurea* is similar in habit, but has gold-tipped young growths. Besides these there are variegated forms of the ordinary type, red-flowered and double-flowered ones of various shades.

Calophaca Wolgarica is the only member of this genus of the Pea family in cultivation in this country; it is a pretty dwarf deciduous shrub, with pinnate leaves, and long-stalked racemes of yellow flowers. It is a native of Southern Russia, and may be readily propagated from seeds, which ripen freely, or by grafting on the common Laburnum.

Calycanthus.—Broadly speaking, there are but two species of this genus, both from North America; the one with numerous forms from the eastern side of the continent, and the other from the western. *C. Floridus*, the Caroline Allspice, has sweetly-scented, lurid, purplish-red flowers, and *C. occidentalis* larger brick-red flowers. Both are deciduous shrubs, the former growing some three or four feet, or thereabouts, in height, and the latter about double that height. Both are desirable shrubbery plants, flowering throughout a considerable portion of the summer in this country.

Caragana.—Of the fifteen species of this genus of *Leguminosæ* more than half are in cultivation, and all are easily-grown hardy deciduous shrubs, or small trees, readily propagated from seeds. *C. Altagana* has large, yellow, pea-shaped flowers, produced singly from the axils of the pretty pinnate leaves. *C. arborescens*, the tallest of the cultivated species, has leaves with fewer leaflets than those of the last-named, and clusters of pale or bright yellow flowers; this comes in useful as a stock whereon to graft the smaller-growing sorts. *C. Chamlagu* has large, yellow, red-tinted flowers and spiny branches. *C. frutescens* and *C. spinosa* are somewhat thorny bushes, the latter forming an excellent hedge-plant. All the above are natives of Northern Asia, are quite hardy in this country, growing freely in almost any soil or situation, and are readily raised from seeds.

Carpinus (*Hornbeam*).—All the Hornbeams are hardy deciduous trees, natives of the north temperate zone. The British *C. Betulus* is a slow-growing, long-lived tree, and a decidedly ornamental one; as a tall hedge or shelter plant it is one of the best, as it bears

cutting remarkably well, and forms a dense mass of twigs and foliage. A cut-leaved variety, *incisa*, has smaller deeply-slashed leaves, and is a very pretty object as a single specimen on a lawn, or in any spot where its distinctive peculiarities can be fully seen. The American Hornbeam, *C. Americana*, is well worth planting for the brilliant tints often assumed by its decaying leaves in autumn.

Carya (*Hickory*).—There are about ten species of the genus *Carya*, all of them natives of North America, where they are known under the general name of Hickory. All are decidedly ornamental deciduous trees, related to the Walnut, and most of them more or less like it in habit. They are well worth growing, and some attain in a short time considerable dimensions. *C. olivæformis* is the Pecan-nut, the delicious nuts of which are frequently imported into this country for dessert. *C. alba*, the Shell-bark Hickory, has large handsome foliage, and forms a noble tree.

C. amara (the Bitter-nut or Swamp Hickory) has bitter fruits, with the shell thinner, and less head than in other species, and with the bark of the trunk close and smooth. In its native habitats it affects a moist soil, but there are fine specimens in the neighbourhood of London, which flourish in a dry, poor, gravelly soil.

Cassandra calycalata is the only member of the genus *Cassandra*. It was formerly included under *Andromeda*, and like that plant does best in a damp peat border. It is a hardy evergreen dwarf bush, with small, oblong, leathery, flat leaves and waxy-white flowers, produced from the axils of the upper small leaves. In a wild state this species is found in North-eastern Europe, Northern Asia, and North America.

Cassiope tetragona, with three or four other species it is not necessary to mention here, was, like *Cassandra*, formerly included under *Andromeda*, and it requires similar treatment. It is a beautiful little shrub, with scale-like imbricated leaves, and globular, pendulous, Lily of the Valley-like flowers, produced in May. A native of Lapland.

Castanea (the Spanish Chestnut, *Castanea sativa*) is, when in flower in July, one of the most striking and conspicuous of the trees of the first magnitude which are hardy in the climate of Britain. The long, erect, yellowish catkins give a feathery appearance to a well-flowered tree, and create a distinct effect in the landscape. A large number of garden varieties are grown in some nurseries, some of the best being *asplenifolia* (or *dissecta*), with deeply-cut Fern-like leaves; and *aureo-variegata*, with the leaves conspicuously blotched and margined with golden-yellow. *C. pumila*, the Chinquapin of the North-eastern United States, is the only other species of the genus *Castanea;* it generally forms a shrub, but sometimes makes a small tree, twenty feet high, and has small, pointed, very sweet nuts, about half the size of those of the commoner Chestnut; the leaves, too, are white and downy beneath.

Catalpa.—The best of the *Catalpas* are the two North American species, *C. bignonioides* and *C. speciosa*. Both have heart-shaped leaves, downy beneath, and open compound panicles of handsome flowers produced in August; in colour these are white, slightly tinged with violet, and dotted with purple or yellow in the throat. *C. speciosa* is said to have flowers larger than those of the commoner species, and to expand its flowers a fortnight earlier. The golden-leaved form of *C. bignonioides* is a very striking ornamental tree, and one which does not seem to suffer, like so many golden-leaved trees, from bright sunlight.

Ceanothus. — Many of the *Ceanothus*, and especially some of the freer-flowering garden varieties which have been raised during recent years, make excellent shrubbery plants. Few, if any, are thoroughly hardy; but many if cut down to the ground by frost will spring up again and flower freely the succeeding summer. In fairly sheltered sunny spots they make a brilliant show, and the flowers range from white to deep bright blue, purplish, &c. For wall plants, *C. papillosus*, *C. rigidus*, and *C. Veitchianus* are amongst the most suitable.

Cerasus (*Cherry Laurels* and *Cherries*). — For convenience of reference, the following plants, now included by the best authorities under *Prunus*, are retained under the most familiar generic name. One of the most important of all evergreens hardy in the climate of Great Britain is undoubtedly *Cerasus Lauro-cerasus*, the so-called common Laurel, which is, however, an altogether misleading name, as the true Laurel, the Laurel of ancient literature, is the Sweet Bay, *Laurus nobilis*. The common Cherry Laurel is a native of Eastern Europe, and was long ago introduced to cultivation in this country. According to Sir Joseph Banks, it was "introduced by Master Cole, a merchant, living at Hampstead, some years before 1629, when Parkinson published his 'Paradisus Terrestris,' and at that time we had in our gardens Oranges, Myrtles of three sorts, Laurustinus, Phillyrea . . . . . All these were at that

time rather tender plants; Master Cole cast a blanket over the top of his Laurel in frosty weather to protect it, but though nearly two centuries have since elapsed, not one of them will yet bear with certainty our winter frosts. Though some of these shrubs ripen their seeds in this climate, it never has been, I believe, the custom of gardeners to sow them; some are propagated by suckers and cuttings, and others by imported seeds; consequently the very identical Laurel introduced by Master Cole, and some other of the plants enumerated by Parkinson, are now actually growing in our gardens; no wonder, then, that these original shrubs have not become hardier, though probably they would have done so had they passed through several generations by being raised from British seeds." During the sixty-five years which have elapsed since the above lines were written, so much has been done to improve the Cherry Laurel, that the original type is hardly grown now, garden varieties of stronger constitution, with larger, handsomer foliage, having almost ousted it. One of the finest of these is *rotundifolia*, with large, short, dark green, roundish leaves, a vigorous compact grower, in every way superior to the type for general effect. Another excellent form is *Colchica*, with narrower, sharply serrated, lighter green leaves than *C. Lauro-cerasus*, but a good hardy kind which has passed unscathed through severe frosts, and has proved destructive to the original type. *Caucasica* is another thoroughly desirable variety, differing somewhat in colour, form of leaf, and texture from *Colchica*, easily enough distinguished from that, but not so easy to characterise on paper; it has rich, deep green, glossy foliage, the broadest part of the leaf being above the middle. The Versailles Laurel, *C. L. latifolia*, makes a handsome shrub; it has very large leaves. Amongst the smaller-leaved sorts the most distinct is the old Willow-leaved Laurel, a dwarf-growing narrow-leaved form which passes under a number of names; this is *C. L. angustifolia*, which now, as in Loudon's time, is found in some nurseries under the absurdly wrong name of *Hartogia Capensis*. The last-named variety is useful for winter bedding, as it is the dwarfest and most compact of all. The variegated forms revert so readily into the green-leaved ones that they are hardly worth growing.

The Portugal Laurel, *Cerasus Lusitanica*, is said to have been introduced in 1648; it is a native of Portugal and the Azores. Probably this is even more valuable as a hardy evergreen than the common Laurel; under favourable conditions it not unfrequently attains a height of thirty feet, and, particularly when in flower, is extremely beautiful. There are several varieties, of which the best is *Azorica*, a more vigorous, erect grower, with finer foliage than the ordinary form; *variegata* is more constant in its variegation than any of the varieties of *C. Lauro-cerasus*, but the colours, dark green and dull yellowish-green, are not sufficiently striking to cause the plant to be used much for effect in the shrubbery. In good rich soil, particularly when trained to a single stem, the Portugal Laurel often assumes the proportions of a tree; it bears cutting in well, and can be grown into any shape. On the Continent it not unfrequently is grown with a clean straight stem in tubs, and the head pinched into globes in imitation of the Orange-trees so dear to French gardeners.

The Holly-leaved Cherry Laurel, *C. ilicifolia*, is not so hardy as the two other species above mentioned; it is, however, a charming evergreen, well worthy of a trial in the South-west of Britain and in Ireland, where it would in most places prove hardy enough to withstand the winter's cold. The dark green Holly-like leaves are very pretty, and when the plant is laden with its short erect racemes of white flowers it is especially attractive. This forms a dwarf compact bush some six feet or so in height; it is a native of California, and is a comparatively recent introduction to British gardens.

The Gean, or Wild Cherry, *C. avium*, is one of the handsomest of woodland trees in April and May. The double-flowered variety lasts longer in bloom than the single-flowered type, and is a very useful, ornamental tree. *C. Caproniana* may be looked upon as the wild parent of the Morello Cherries; it is a much smaller-growing species than the first-named one, and its double form has purer white flowers. *C. Chamæcerasus* has clustered flowers, followed by small round, reddish-purple, very acid fruits; it is a dwarf grower—on its own roots it rarely attains more than four feet in height—so is generally grafted on the Wild Cherry stock. Like the two preceding species, this is European. *C. depressa* is a North American, prostrate, deciduous shrub, a profuse flowerer, suitable for planting in the front rank of the shrubbery. *C. Padus*, the Bird Cherry, a native deciduous tree, has long drooping racemes, and does well either in the shrubbery or near water, in the park or pleasure-ground; of this there are forms with cut leaves, and others with variegated foliage. *C. serrulata*, the double Chinese Cherry, is one of the most floriferous of all the species; it produces its large pink-tinted flowers in April. *C. serotina* and *C. virginiana* are North American representatives of our British Bird Cherry, *C. Padus*.

Cercis.—*C. Siliquastrum*, commonly known as the Judas Tree, has handsome, smooth, kidney-shaped leaves and rosy-purple flowers, produced in great profusion before the leaves are fully developed. It

is a native of Western Asia. *C. Canadensis*, a North American species, is similar in habit, but has fewer paler-coloured flowers; and *C. Chinensis* has larger rosy-pink flowers. All three are beautiful shrubbery plants, and the first-named, under favourable conditions, sometimes attains a height of twenty or thirty feet.

Cistus.—The Rock Roses, or Gum Cistuses, are amongst the most showy of flowering shrubs, and although their flowers only last a single day, a succession is produced in profusion for a considerable period. It is only in the South of England that most of the Cistuses can be called hardy. *C. laurifolius*, the hardiest in the entire genus, has evergreen three-nerved leaves and white flowers, with a yellow blotch at the base of each petal. This species, too, grows taller than most of the rest; it attains a height of six or eight feet. *C. crispus* has purple flowers; *C. hirsutus* is white, with a golden blotch; *C. Monspeliensis*, white; and *C. purpureus*, reddish-purple. *C. ladaniferus* has very large flowers, white, with a claret-coloured blotch at the base of each petal.

The Clematis.—Of all the genera of climbers suitable for general cultivation as ornamental plants in the British Isles, one of the most useful and popular, as well as perhaps the most beautiful, is the genus *Clematis*, the Traveller's Joy, or the Virgin's Bower. Clematises are found in all temperate climates, and are rarer in tropical regions. Of the hundred species known to science, the greater part are woody climbers, and a goodly proportion of these are handsome garden plants. The following is a selection of the best of the hardy kinds:—

C. æthusifolia, from Northern Asia, is by no means remarkable, either for the colour or size of its flowers, but the profusion in which they are produced, and the beautifully-cut light green leaves, render it a very taking plant. It probably hardly grows much more than about six feet in height, so it is best to plant it in the shrubbery border, and allow it to grow naturally on some rustic support; the upper portion of a Fir-tree properly fixed makes an excellent one. The flowers are between bell-shaped and cylindrical in form, about an inch long, and nearly white in colour.

C. aromatica.—The native country of this is unknown. It is probably of hybrid origin. The flowers are deep violet-blue, and sweetly scented. This hardly grows higher than six feet, and is of much more formal habit than the last-named.

C. Balearica is a South European evergreen species which flowers in the winter and spring. In sunny spots in the South and South-west of England (elsewhere in this country, although it grows freely, the wood is rarely ripened sufficiently to flower), this is one of the most distinct and beautiful of winter-flowering shrubs. The leaves are dark green, ternate, and the flowers, which measure about two inches across, are greenish-white, copiously marked on the inside with reddish dots.

C. cærulea, a beautiful large-flowered species, introduced from Japan some fifty years ago, is still one of the best. It is the parent of many garden forms, single and double, none of which surpass in beauty the type with its large pale violet flowers.

C. cirrhosa, a South European species, is not unlike *C. Balearica* in general aspect. It has, however, somewhat smaller unspotted greenish-white flowers. Like *Balearica*, too, it flowers in winter and early spring.

C. Flammula, the South European representative of our native *C. Vitalba*, has dense panicles of small white fragrant flowers, which are, moreover, sweetly scented. It is one of the oldest of the exotic Clematises in English gardens, and grows and blossoms freely in most places. It is suitable for planting in semi-wild spots, and may be trusted to take care of itself amongst low-growing trees and shrubs.

C. florida, a native of Japan, has been upwards of a century an inmate of British gardens, and is the parent of not a few handsome garden forms and hybrids. It has large pale white flowers (borne on the wood of the previous year), during the summer months. A double form is more frequently met with than the type.

C. lanuginosa, introduced from China in 1851, has contributed a large number of hybrids and seedling forms. It has very large pale lilac-tinted flowers. Many of the finest of the "show" Clematises, now grown either for outdoor or conservatory decoration, have been derived from this species. Its flowering season is a prolonged one, and the blossoms are developed on the young growing summer wood.

C. montana is an Indian species, with pure white flowers, produced in spring from the previous season's wood. It is a charming plant for a high wall.

C. Viorna, the Leather-flower of the United States, has a somewhat bell-shaped flower, with very thick and leathery purplish sepals.

C. V. coccinea, a variety from Texas, that has only recently been brought into public notice, has very fleshy sepals, vermilion outside and yellow within. If this should prove quite hardy—the writer has seen it growing against a wall in the open air without any protection for some years—it will be one of the most distinct and beautiful of outdoor shrubby plants.

C. virginiana, the common Virgin's Bower of the United States, is a vigorous climber, with panicled clusters of small whitish flowers. Like our British

species, this is very conspicuous in autumn, by reason of the long feathery tails of the fruit.

C. Vitalba has, perhaps, a wider distribution than any one of the species already mentioned. Besides Britain it occurs throughout Europe (from Holland southwards), in North Africa, and West Asia. The greenish-white almond-scented flowers in late summer, and the long feathery tails of the fruits in autumn, render large plants of this very conspicuous.

C. Viticella is not so rampant a grower as the last-named; but no Clematis is more beautiful and graceful than this when allowed to grow in a natural manner amongst low-growing trees, or on rustic supports. The long-stalked drooping flowers are rather large, and vary from blue and purple to rose. It produces a succession of blossoms from June to September, and flowers on the young growing wood. A native of South Europe and Western Asia. Many hybrids and seedling forms, some very beautiful, have been derived from this species.

Hybrids.—One of the earliest, and still one of the very best, of the popular large-flowered hybrids is *C. Jackmannii*, with its large deep violet-purple flowers, produced during nearly the whole of the summer. A host of others may be found described in the catalogues of most nurserymen. Most of these require either the shelter of a wall, or to be grown on trellis-work, or supports, in sunny spots. Some of the continuous bloomers, like *Jackmannii*, have been successfully employed for massing in large beds.

Cultivation.—The large-flowered sorts just mentioned like a rich, deep, loamy soil, and thrive all the better if frequently top-dressed with manure. The species which flower on the previous year's wood will, of course, require different treatment with regard to pruning from those which blossom on the young growing summer wood. The latter can be cut down as required, but the former can only have superfluous branches removed. The best sorts for the Wild Garden, or for draping old trees in the park or pleasure-ground, are *C. Vitalba*, *C. virginiana*, *C. Flammula*, and *C. Viticella*. *C. Jackmannii*, amongst the hybrids, is perhaps the most vigorous grower, and for an old trunk, where it is fully exposed to light and air, and can be attended to now and then with manure or fresh soil, it makes a very beautiful covering. All may readily be increased by cuttings or by layering the young growing shoots. In some establishments recourse is had to grafting to a very large extent. Pieces of the fleshy roots of *C. Viticella* or *C. Flammula* are used as stocks, and to these are bound short lengths of the tender stems. No claying is needed, provided the cut surfaces are firmly and neatly bound together. The "grafts" are then potted in small pots, and these plunged in ashes or cocoa-fibre in a close propagating-frame.

SMALL AND BUSH FRUITS.

By D. T. Fish, assisted by William Carmichael.

THE CURRANT.

THERE are two species of the Currant, both indigenous to this country—the Red Currant, *Ribes rubrum*, and the Black Currant, *Ribes nigrum*. The White Currant is merely a variety of the Red, and is not a distinct species. It is, however, more soft and sweet in flesh, and as far as eating for dessert is concerned, every way superior to the Red Currant, the absence of colour seeming to add to its quality. The Black Currant is so widely different from the other two, as to warrant the claim to a distinct genus rather than a species; the fruit not merely differs wholly in colour, but almost equally so in its form of growth and quality. Instead of being produced in long regular bunches, the fruits are either solitary, or congregated into small, loose, and irregular bundles. The quality is harsh, almost austere, contrasted with the sharp, tart, or mild acid flavour of the other Currants. Of late years, however, a new variety of Black Currant has appeared, Lee's Prolific, which is so much sweeter than the other, and indeed so different, as almost to merit elevation to a distinct species. Most of the harshness and austerity seems to have gone out of this superior Black Currant, and its flesh is tender, sweet, and richly flavoured; the bunches are larger, as well as the berries, which are of nearly equal size throughout. Black Champion is another novelty of similar class, with equally large or larger berries.

Commercially, Currants are of very great importance, more money being made out of them than Gooseberries, or far larger superior fruits. From the enormous quantities used for tarts as gathered, preserved in bottles for this purpose for use throughout the season, and converted into jams and jellies, Currants have always a ready sale, and command good prices. They are also less perishable, and bear transit to long distances better than many fruits. Once converted into preserves, they will keep for almost any length of time. Amateurs and cottagers also convert many of their Currants into wine, though the introduction of cheap wines has greatly limited the quantities employed for these purposes.

The Currant is also a far more certain crop than most others—the Gooseberry for example—from its being later, and its bunches drooping downwards more under the leaves than those of the Gooseberry; this peculiar habit enabling it the better to escape spring frosts. Currants are much more popular with cottagers in most parts than Gooseberries, and command higher prices. This is especially true of Black Currants, particularly along some of our main

lines, where a special and good-paying trade has sprung up among railway employés and others in Black Currants. A dozen or score or more of good bushes of the latter not seldom pay the rent of the cottage and garden, and thus become not only a great source of interest and pleasure, but a sure and almost certain means of profit. For Black Currants are a more reliable crop than either Red or White; and there are also degrees of hardiness and of certainty between these two, the White being the least hardy, and commercially of least value; for somehow or another White Currant jam or jelly, delicious almost as golden honey when well made, is by no means popular, while no one cares to eat White Currant tarts or puddings, the redness or jet-blackness, as the case may be, being part of the charm of those auxiliaries to health and appetising and wholesome articles of diet.

The propagation, planting, training, and general culture of the White and Red Currant hardly differs from that of the Gooseberry already described. That of the Black Currant is different, and shall have separate notice.

As to propagation, some prefer their Currants with taller stems than Gooseberries, and the cuttings might be sufficiently long, say a foot to eighteen inches in length, to permit of from nine inches to a foot of clear stem for the ordinary form of cup or vase-shaped bushes. Early autumnal insertion is also of more moment to Currants than Gooseberries, as the Currants are longer in rooting. Neither does layering the points of the shoots answer so well for White and Red Currants as for Gooseberries, as they neither root so freely, nor do the plants so layered thrive so well afterwards. Black Currants, however, root freely from layers, and may even be propagated by division of the root-stock, as the one-stem system is of little moment for these.

The Planting of Currants.—The soil may be the same as for Gooseberries. A deep, rich, friable loam, well enriched with manure, such as farmyard, soot, house slops, &c., suits Currants admirably. Currants seldom burn or scald with the sun, so a shady site in warm localities is not needful. Still, Currants grow well, and acquire full size and the highest colour, in the dense shade of north walls, though they are more acid in such positions than when grown in the open and fully exposed to the sun's light and heat.

Distances from a yard to two yards apart may be adopted, five feet by four, or even six by four, being frequently used as the best. Horizontal-trained bushes on walls or espalier rails are mostly planted a yard apart. From these, two branches, one on either side, are trained to the right and the left, and from the latter vertical branches seven or nine inches apart. Single cordons are planted nine inches apart.

Black Currants are often planted at distances varying from a yard to four feet asunder, and it is good and proper practice to plant them considerably closer on rich deep soils, and allow them to form a boundary or dividing fence, a yard, two, or more through. Gooseberries are often planted in the same way and for similar purposes, and planting in this style will prove most profitable when the bushes are allowed a great amount of freedom of growth, and subjected to but little or no training afterwards. Such fruit-bush hedges will, on good soils, reach a height of from four to seven feet, and as much through, and produce enormous quantities of fine fruit, utilising almost any amount of house slops, sewage, or manures in the process.

The pruning, training, and general treatment of Red and White Currants does not differ from that described for Gooseberries. The advancement of the leading shoots by leaps and bounds of from six to nine inches, and the close spurring of all others to develop fruit-spurs at their base, are the chief points. The shoots of Currants being, however, larger, softer, and more full of pith than Gooseberries, they should be cut even closer back to their base, a half or even a quarter of an inch being sufficient. If these shoots are left too long, the rains and frosts of winter are apt to enter and rot the wood, to the injury of the trees. Besides, if the young wood has been shortened back early in the season, the base-buds will be found sufficiently developed to produce an abundant supply of fruit and wood-buds. As Currants and Gooseberries advance in years, bunches of fruit-buds are developed all over the branches, and so soon as the bushes reach full size, and get into full bearing, less and less pruning will be needful, and all of it may take the form of hard pruning, that is, severe cutting back to the base of the shoots.

The most popular form for Currants, as for Gooseberries, is that of the flat bush with an open centre; neither does the White or the Red Currant take so kindly to the pyramidal form as the Gooseberry. On the other hand, however, the Currant yields more kindly to budding and grafting than the Gooseberry, though that can also be worked successfully. Nice standard Currant-trees may be formed by working the desired varieties on to the tops of any strong suckers or cuttings that may be run up to the desired heights; and such forms of Currant-bushes are very effective along the edges of walks, the effect being heightened by alternating White and Red. The Black is neither so suitable nor effective for these semi-ornamental purposes. The formation of these will be hastened, and the future health of the tree

more firmly established, if a few short side shoots are allowed on the stem during the earlier periods. These can all be removed when the plant is established. Perfect verticality of stem must be insured, and the stability and safety of the top placed beyond risk, by the use of stout wooden or iron stakes. Nothing looks worse in a garden than a standard Currant, or Rose for that matter, with its head pointing to almost every point of the compass instead of straight up.

Special Pruning and Training of the Black Currant.—As this fruits far less on spurs than on the young wood of the former year, it follows that the great art of the successful pruning and training of this variety consists in furnishing the bushes with a constant supply of young wood. The simplest way of doing so is to allow the bushes to grow freely into masses, that are constantly renewing themselves from the centre, and disposed to weep down to the ground at the sides. As these outer branches become partially exhausted, or touch ground at the extremities, remove a few, or many of them, annually, and also thin out a few of the worst and most crossed boughs right back to the root-stock. By such sure and judicious pruning an abundant supply of young wood will ever be forthcoming, and the bushes may be sufficiently limited to any given area, or kept into form. But anything like stiffness or formality should be avoided in the training of Black Currants, and everything like spurring, either close or long, avoided. The open centre, vase-shape, and other forms so highly esteemed by the growers of Gooseberries, and White and Red Currants, would be entirely out of place for Black.

When placed against walls no formal training should be attempted. Place the bushes against the walls, and let them spray out like half irregular bushes from it, of the same form as half of the Black Currant hedge, already recommended. These backed against the walls of cottages and out-houses, and left free, or only subjected to such occasional pruning as already described, will produce enormous quantities of fruit of the finest quality.

The General Culture of Currants.—This does not differ from that of Gooseberries. It is almost impossible to overfeed Currants in full bearing. Surface mulchings of the richest manure suit them well, as do soakings of manure-water of all kinds.

Drought at the roots is fatal to size or quality; and to have Currants of the largest possible size, thinning alike of bunch and berry is essential.

The Currant is so enormously fertile that it often sets double or treble the crop that it is able to bring up to anything like full size. For jam, jelly, tart, or pudding, this matters less, though even for these small fruit yield an excessive percentage of rind to that of flesh and juice, thus rendering the products hard and dry instead of soft and sweet. But for dessert small Currants are useless, and few dishes are more effectual on the table, and more relished by those of limited means and simple tastes, than a mixture of White and Red, or a dish of fine jet-black Currants, the latter sometimes nearly an inch in circumference, and more like Cherries than Currants.

White and Red Currants may also be developed to abnormal sizes by the thinning of the berries, as well as the bunches, and by special means of fostering and feeding. But this belongs rather to the specialities than the generalities of culture, and may be ranked along with the special contrivances of the prize growers of Lancashire Gooseberries, already so fully described in our article on that fruit. Hard pruning and also the thinning of the fruit-spurs are other means of enlarging the size of the bunches and berries of Currants.

Gathering and Serving the Fruit, and Preserving it on the Bushes.—Like all other fruit, it should be gathered dry, whether for eating raw, preserving, or cooking. The sooner they are consumed after gathering, the finer and fresher the flavour. Served on their own leaves, tastily dished, either in single colours or mixed, they are very effective. Currants possess the merit of hanging long on the bushes after they are ripe. The Black Currant, however, does not possess this quality to anything like the same extent as the others, being about on a level with the later Gooseberries, such as the Warrington and Ironmonger, in this respect. But if Red or White Currants are carefully protected from wasps and birds, and as much as may be from wet, by the use of thick mats or canvas, they may be kept fresh and sound on the bushes till November. Their hanging power is a great advantage to families fond of Currants, who may pick and come again to the bushes for more from July to December.

Another rather valuable peculiarity about Currants is that birds will seldom devour them after they are decidedly out of season. So pronounced is this peculiarity that nets, so needful for protection early in the season, have been removed and Currants hung unprotected and unmolested on bushes, espaliers, and walls, until near to Christmas. The old plan of protecting Currants on the bushes—that of tying the latter together in the form of a rough cone as nearly as may be, and placing a new mat round it as tightly as possible, finishing the mat into a sharp point in the centre, something in the form of a bee-hive thatched with reeds—has never been bettered. Mats so disposed and drawn tight are virtually water-

proof, and preserve the fruit well. They, of course, are injurious to the bushes if kept on too long.

Special and Pot Culture of the Currant.—The Red and White Currant are even better adapted for pot or tub culture than the Gooseberry, and do equally well or better under this highly artificial treatment. The staying property of the ripe fruit is so great as to enable these fruits to take rank among ornamental berried plants. The Gooseberries cannot be made to hang much more than a month or six weeks on the bushes after they are ripe; but the Currants will hang, as we have already seen, several months. The foliage is also highly ornamental through all its stages. Black Currants are hardly so showy, nor so permanent, though many plants grown for ornament only are not more imposing or beautiful than a well-formed bush of, say, Lee's Prolific, bending under its heavy load of jet-black berries until it almost hides the pot.

The Currant will also live and thrive in trying positions in which even Gooseberries will barely succeed. In the small jack-towel gardens in towns, in yards, on roofs and balconies, the Currant can battle better with the dust and the smuts than the Gooseberry; and for this simple reason—the leaves and fruit are smooth. Impurity does not stick to Currants as to Gooseberries, and what does adhere to them is far more easily washed off.

The Red Currant especially is almost worth growing on balcony or dwelling-house for its highly ornamental qualities alone. If less glaring, it is also more graceful than the Pyracanthus at its best, while it throws the Cotoneaster into the shade at its brightest.

But the Currants also yield capital crops of good edible fruit in pots under similar treatment to that recommended for Gooseberries, and tens of thousands who can never hope to sit under their own Vine and Fig trees, may at least have the pleasure of growing their own Currants in the smallest possible gardens or in pots, and of *eating their fruit off the bushes*. Those who have many yards or acres of ground, well furnished with fruit-trees and bushes of various sorts, can form no idea of the pleasure which a few fruitful Currant-bushes in pots can afford.

All that is needful to command success, is to secure nice young bushes to start with; pot up in October or November in ten or twelve-inch pots; protect the roots from frost and drought with a porous non-conducting mulch; see that the roots never suffer for lack of food or water, or from excess of heat or cold; beware of over-cropping, and keep leaves, branches, and fruit as clean as frequent syringing can make them.

Any and every possible mode of training may be adopted with success. But for training along low walls or the fronts of balconies, there are no better forms than some of the many-shaped cordons. While for artistic effects along verandahs, balconies, kitchen or flower garden walks, standards from three to four feet high are the most striking. These laden with healthy foliage, and bunched all over with coral, are far more satisfactory as ornaments than not a few of the shivering and shrivelling-up Myrtles, Orange-trees, Pomegranates, and Oleanders, that one so often meets with in such prominent positions.

Currant-trees also introduce a useful variety into orchard or other glass houses, and will even bear gentle forcing without the risk of fruit dropping, which not seldom clears off most or all of the fruit from Gooseberry-bushes under like conditions; the Black Currant, however, is more impatient of heat and a confined atmosphere than either the Red or the White. The Currant will bear a temperature under glass of from 55° to 65°, not only with impunity, but to the improvement of its flavour. But unless it is a special favourite, the forcing of the Currant is not recommended; those who have space to spare had better fill it with the choicest Apples, Pears, Plums, or Figs.

Varieties of the Currant.—Fortunately for those who have to perform the mostly thankless office of selection, these are by no means numerous.

Cultivators and hybridists do not seem to have done much among the Currants, and hence the old varieties hold their ground; though the success of Mr. Lee, of Clifton, with his Prolific Black, shows how much can be done in these directions. Neither are our White or Red Currants, in all probability, anything like so large and so sweet as they may yet become.

Select List of Currants.

Black Naples—fruit large and good, flavour mild and sweet.
Cherry Currant—fruit very large, deep red; a valuable early variety.
La Fertile—fruit large; a fine red kind, and a great bearer.
Lee's Prolific Black—fruit very large and richly flavoured, and very prolific; best of the black kinds.
Mammoth—fruit large and fine; a good red kind.
Raby Castle—fruit medium size, bright red; an excellent late kind.
Warner's Grape—fruit large, red, long-bunched; fine for exhibition.
White Dutch—Fruit medium size, small and well-flavoured; a good dessert kind, and keeps well if protected.
White Dutch Cut-leaved—fruit large, long bunches; a fine dessert kind.

To these may be added the Champion Black, already noted; Knight's Sweet Red; Wilmot's Long-branched Red, bunches six inches in length, berries large, and of a deep red colour; Red Dutch, a good companion to the White Dutch; and Wilmot's Large White.

Diseases and Insects.—The diseases of the Currant, like those of the Gooseberry, are *nil*. The Currant, however, is subject to the same insect pests, and hence must be treated to the same remedies. In addition to all the insects named as preying on the Gooseberry, the Currant is exposed to several others that seldom molest the Gooseberry, or, at least, not to the same extent. Among the latter is the green or black fly, or aphis. This occasionally infests the points of the young shoots of Gooseberries, but more frequently of Currants, especially Red and White ones. The flavour of the Black seems too pungent even for aphides.

The simple and only efficient remedy is to cut off the tops, so far down as the aphides extend, and burn them. The shoots when badly infested are already useless, and by removing them, and treating as recommended, a wholesale and thorough clearance of the pest is insured.

A similar summary process rids the Currant-bushes of two other pests that devastate the shoots rather than the foliage. These are the larvæ, or caterpillars, of the *Lampronia capitella*, and the Currant Sphinx, *Ægeria tipuliformis*. Both of these penetrate the wood, and work along the pith, causing the shoots to droop, and the leaves to wither; and so soon as these symptoms are noted, the whole of such shoots should be cut off considerably below the point where any symptoms of shoot or leaf drooping are noted, and at once burned. By adopting these radical measures in time, these troublesome pests will be kept in check, or completely eradicated.

As to the Gooseberry caterpillar and saw-fly, that prey at times with equal persistency on the Currants they must be fought and exterminated with the same weapons; and the great secret of success is to begin in time, and keep pegging away until none are left. Half-measures are a sheer loss of time, material, and force in such matters; as if only a few insects are left, the rate of increase is so rapid and enormous that all partial reduction is virtually so much labour lost.

CHOICE HARDY BORDER PLANTS.

By Richard Dean.

Centranthus (*Red Spur Valerian*).—Under the old nomenclature this plant was known as *Valeriana rubra;* it is now found in catalogues as *Centranthus ruber*. It is a very fine and useful old-fashioned perennial, known in some localities as Pretty Betsy; another of its common names is that of Setwell. The generic name—*Centranthus*—is believed to be derived from the Greek words *kentron*, "a spur," and *anthos*, "a flower," the corolla being spurred, hence it is known as the Red Spur Valerian. The Valerians, with which this plant, as already stated, was formerly associated, possess certain medicinal qualities; but the Centranthus little, if any. *Ruber* refers to the colour of the flowers. How the name of Pretty Betsy originated we do not know, but that of Setwell is derived from its old Saxon title of *Setewall*, which may be compounded from *settan* and *wæla*, signifying "to establish in good condition;" but one authority thinks the name refers to the plant usually being found growing on a wall, and, if that be so, we may assume that its derivations are *sete*, "set," and *wal*, "a wall," literally "wall-seated."

Travellers by the South-Eastern Railway, *viâ* Gravesend, cannot fail to observe this plant growing freely from the chalk, and in some places almost covering the chalk cuttings with its rosy-red flowers. There it has established itself, and remains very lasting. It does well on banks, on which the plants live long and flower freely, on borders, margins of shrubberies, &c. We saw it a few days ago used as a back row on a border skirting a broad gravelled walk, and it seemed impossible to do justice to its great beauty and effectiveness. It does well in any good garden soil, and should have an open and sunny position. As it seeds very freely it can be best increased in this way. It is a native of Southern Europe. There is a variety with white flowers, but it does not appear to be so popular as the red form.

Cortusa (*Sanicle*).—This genus is named after Cortusas, an Italian botanist. The common Sanicle is *Sanicula europæa*, a plant formerly much celebrated as a vulnerary, and it is said the whole plant is charged with a poisonous acrimony, particularly when grown in a moist soil. The healing virtues of the Sanicle have, in England, passed into a proverb: "He that hath Sanicle needeth no surgeon;" whilst the French have a corresponding old saying regarding its curative powers:—

> "Who Bugle and Sanicle hath,
> May safely at the surgeons laugh."

In England it was in former days called Self-heal, for, according to one old herbalist, it would "make whole and sound all wounds and hurts, both inward and outward" (Folkard's *Plant-Lore*). *Cortusa Mathioli* is the Alpine Sanicle; it is allied to the *Primulaceæ*, and resembles *P. cortusoides*, flowering in early summer, the flowers a deep purplish-crimson; the foliage is large, resembling that of *Primula mollis;* it is a very interesting and pretty plant, requiring to be cultivated with care, and succeeds best in a moist shady nook. A variety named *grandiflora*, from Central Asia, is far superior to the

type, both in size and colour. *C. pubens* is a recent introduction from Central Europe, and bears pink flowers. It is a plant that must have shade during the hottest part of the day: it does best in a mixture of sandy loam and peat, and can be successfully grown in pots. The *Cortusæ* can be increased by division of the roots.

Corydalis (*Fumeworts*). — The generic name comes from *korydalos*, "a lark," the spur of the flower resembling that of the lark. All are beautiful hardy plants, mainly perennial. One of the best known is *C. lutea*, the Yellow Corydalis, a native of Southern Europe, and naturalised on old walls in various countries. It is a somewhat dwarf-growing but graceful plant, with Fern-like foliage, forming close tufts, abundantly dotted with yellow flowers in early summer. *C. nobilis* is the handsomest of this family, bearing rich golden-yellow flowers in early spring; a grand plant for a moist, shady spot. This is a native of Siberia, and is known as the Noble Corydalis. *C. solida* is a popular free spring-blooming species, bearing purplish-rose flowers; a charming plant for the open border, making a good edging plant for taller subjects. *C. cava albiflora* is also a pretty spring-flowering Fumitory, with spikes of pleasing white flowers, growing best in a moist loam having stones mingled with it. *C. Ledebouriana* and *C. eximia* (correct name *Dicentra eximia*) are also valuable and useful garden plants, doing well in good garden soil.

Dielytra.—The Dielytras are also Fumeworts, and are allied to Corydalis. They are more properly Dicentras, but the name Dielytra will cleave to many of the best-known forms for many years to come. They may be classed with the hardy perennials, though not altogether hardy. There have been species in English gardens for years past: all spring-flowering herbaceous plants. One species, *D. formosa*, is an old inhabitant of our gardens, but though a pretty, graceful plant, is altogether eclipsed by *D. spectabilis*, the Mountain Dielytra, introduced into England in 1846 from the North of China, and now holding as high a place in the estimation of English gardeners as it has ever enjoyed among the mandarins of its native province.

The genus Dielytra, from the Greek *dis*, "two," and *elytron*, "a pouch or purse," is so named from the inflation of the two outer petals at their base. *D. spectabilis* is one of the most useful hardy plants added to our collections for many years. This plant was described by Linnæus from dried specimens, and named by him *Fumaria spectabilis*, but was not seen alive by any European until sent to this country by the late Mr. Robert Fortune. It is largely grown in Holland and Germany, and sent to this country for forcing purposes in the autumn and winter months. It is a spring-flowering, deciduous, herbaceous plant, with large fleshy roots. The stalks and leaves rise to two or more feet; the flowers are produced in spikes from four to six inches long, and hang down gracefully from the under side. It grows in any soil, but does best in a fine deep sandy loam. It also makes an excellent pot plant for forcing into flower in early spring.

There is a white variety of *D. spectabilis* which is equally useful, though of course not so showy. The Dielytra is known as the Ladies' Locket, from the beautiful shape of the flowers. *D. cucullaria*, a native of North America, is the Dutchman's Breeches of the early New England settlers. It is a very graceful and interesting plant for half-shady nooks in the rock garden among dwarf shrubs, or the margins of shady beds. The flowers are white, tipped with yellow, borne on stalks nine inches in height; it does best in a peaty soil. *D. eximia* is now regarded as *D. formosa;* it is a charming spring-flowering plant, having delicate light green Fern-like foliage, and racemes of drooping reddish-purple flowers: an excellent plant for spring decoration. It is a native of the mountains of Virginia and North Carolina.

We may remark that the hardiness of the Dielytra is in a great measure determined by the nature of the soil in which it grows. When planted in a dry sandy loam, it is rarely injured by the severest winter weather; but, on the other hand, long-continued frost and snow will completely destroy the plants that grow in a deep, strong, moist loam. If the soil be of this character, then the Dielytra should be grown in pots, and not trusted to the open air, unless it can be protected at the proper time.

D. spectabilis furnishes the most obvious example of the remarkable economy of the sexual organs of its race. The flowers of Fumitories never open, and their peculiar construction seems to offer no means for the pollen to escape; but, by a peculiar contrivance connected with the parts, fecundation is effectually and simply brought about.

Digitalis (*Foxglove*).—Almost every one knows the common Foxglove, *D. purpurea*, and its white variety, *alba*, as it is so common in pastures, hedges, dry banks, and walls, on a gravelly or sandy soil, but almost unknown in the lime-stone districts. The name of Digitalis is derived from *digitale*, "a finger-stall;" or, as Dr. Turner interprets it, "Thimble-wort," which refers to the form of the flower, as *purpurea* does to its colour. It is said that the generic name was given to the Foxglove in 1542 by Fuchs, who remarked that hitherto the flower had remained unnamed by the Greeks and Romans.

Various explanations have been given as to the apparently inappropriate English name of Foxglove. In some Saxon MSS. it is written "Foxes cleoff." Now, *cleoff* is "a bed or nest," and in those days of phonetic spelling, "Folcs" might readily pass into "Foxes." If this were so, then the Saxons called this the "Folcs cleoff," or "Fairies' bed." "The Foxglove is the special fairy flower; in its spotted bells the 'good folk' delight to nestle."

Of the many perennial species that have been introduced to this country, only one or two remain in our gardens at the present day. The best known is *D. lutea* or *D. grandiflora*, a yellow-flowered form, quite hardy, easily grown, and forming an effective plant. But nothing else in the Foxglove way can compare with the fine improved varieties of *D. purpurea*, now so much grown in gardens; especially what is known as the "Spotted Strain." There are now many varieties, of varying shades of colour, and, whether they are white, flesh, pink, rose, lilac, purple, or crimson, the interior of the flowers is very handsomely spotted with dark blotches, while the flowers are very large and singularly handsome. They are well adapted for shrubbery borders, and do well in a deep sandy loam. They can also be used with great effect on the margins of low evergreens. We recently saw some large beds of the common Irish Ivy growing under the spreading branches of huge Cedars of Lebanon; and on the margins of these Ivy carpets were plants of these fine Foxgloves, and the effect was delightful.

As the varieties of *D. purpurea* are biennials, some seed should be sown every year in May, so as to have a succession of plants. It should be sown on an open spot in the garden, and when the plants are large enough they can be transplanted to where they have to flower. As they are liable to be damaged by the wind, a sheltered position should be afforded them.

Doronicum (*Leopards-bane*). — The Leopards-bane is a name derived from two Greek words, signifying "a pard," and "choke," the name of some poisonous plant, which Neander says, in his "Theriaca," was used in Mount Ida to destroy wild beasts: transferred by Turner to the Truelove, a very innoxious one—*Paris quadrifolia*, a native of thickets in Europe, Asia, and North America. It is considered a narcotic poison; its berries, which, it is said, poison poultry, are the more deleterious parts of the plant.

Why the Doronicum is called the Leopards-bane, is not made clear. We get Doronicum from the Asiatic name, *Doronigi*. It represents a genus of early-flowering and hardy herbaceous plants for borders. All the species and varieties now found in gardens bear yellow flowers. One of the best known is *D. caucasicum*, the Caucasian Doronicum, a showy perennial, growing about a foot in height, bearing in spring large yellow flowers. *D. austriacum* is the Austrian Doronicum, taller than the foregoing, and a little later in flowering; a native of Hungary and Bohemia; also yellow-flowered. One of the best is *D. Clusii*, a fine and showy form, producing large bright yellow flowers in great profusion. The Doronicums are accommodating plants, and do well in any good garden soil; and can be readily propagated by dividing the plants after they have done blooming. Clumps can be lifted in early spring, placed in pots, and brought into flower early under glass.

Epilobium (*Willow Herb* or *French Willow*).— We get the generic name from *epi*, "upon," and *lobos*, "a pod;" the flowers being superior, and seated on the seed-pod. The common name is derived from the leaves of the plant bearing resemblance to those of the Willow. The Hairy Willow Herb, *E. hirsutum*, is known by the common name of Codlins and Cream, or Apple Pie, on account of its smell. This should be planted by the margins of streams, ponds, &c., as it loves moist places. It is a native of Britain, and frequently to be met with by the margins of streams. *E. angustifolium*, the French Willow, is perhaps the most showy perennial that blooms in the middle of summer; colour bright crimson, and there is a pure white variety of it also, equally valuable. It is a native of the mountain woods and pastures of Europe and Siberia, and many parts of Britain. When planted in a border it runs so quickly as to become a troublesome weed; but when allowed to run wild in a rough shrubbery or copse, with Foxgloves, it is a very fine decorative plant. *E. Dodonæi* is of dwarfer growth, bearing deep rose flowers in summer, and doing well in borders and upon the edges of shrubberies. It is a native of Piedmont. *E. rosmarinifolium* is the Rosemary French Willow, growing two to three feet, bearing purplish-rose flowers, and, like the foregoing, deserves a place in the border. It is a first-rate and easily-grown perennial, not nearly so much cultivated as it deserves to be. It is a native of Europe. All the foregoing do well in a moist loam, and when planted in the border should be allowed sufficient space to develop themselves.

Erpetion reniforme.— This is the Kidney-leaved New Holland Violet, a delightful little plant that mantles the ground with a mass of small kidney-shaped leaves, has numerous slender creeping and rooting stems, and bears blue and white

flowers of exquisite beauty, rising not more than a couple or three inches from the ground, and produced continuously throughout the summer. In some plant lists it is classed as a species of *Viola*, and a Violet it is indeed, but a Violet of the Southern Hemisphere, one at home under a Port Jackson sun, but without the vigour and depth of colour of our northern Sweet Violet, yet having a simple loveliness that makes it acceptable in English gardens, even though it is not hardy enough to stand our winter. Except in very mild districts, it will perish in winter, and so we strongly recommend that it be grown in pots, housed in a cold frame, and covered up in severe frosty weather. We have grown it in this way with great success. It can be readily propagated by division of the roots, and it is a good plan to break the clumps to pieces in the winter and repot them, and plant them out on a well-drained bed in a cold frame. It might be planted out in early summer among bedding plants, and used as one of them.

Erpetion reniforme.

Ficaria (*Pilewort*). — Ficaria is derived from *ficus*, "a Fig," in reference to the Fig-shaped little tubers of the root. Pilewort is from *pila*, "a ball," in allusion to the small tubers, and its supposed efficacy as a remedial agent. It is now included under Ranunculus. Our British and very common *Ficaria ranunculoides*, or Lesser Celandine, would be well deserving of culture were it not so very plentiful. It is to be found in many moist meadows, flowering finely and freely in spring. But there are varieties of it that form a pretty and useful group of plants, sometimes flowering as early as February. There is the white variety of *F. ranunculoides*, and there is also a fine double garden form. They are immense Buttercups, and they will grow under trees and in the grass where it is cool and moist. *F. grandiflora* is a near relative of our common Pilewort; it is a native of Southern Europe and Northern Africa; it is very fine, but should have a place on the rockwork, planted in sandy loam. *F. ranunculoides* is called the Lesser Celandine, from its blossoming at the season when the swallow arrives.

Francoa.—This genus is named after F. Franco, a Spaniard, and comprises a group of herbaceous perennials, natives of China, hardy in favourable situations, but not in the ordinary acceptation of the term. One of them, *F. ramosa*, has come to be largely grown in pots for the decoration of the green-house and for cutting purposes. It is a thoroughly good old-fashioned plant, that was almost lost through neglect but, having been recognised as a valuable and useful plant, has fortunately come to be largely cultivated. In hundreds of places, and especially by the sea, it has proved quite hardy, but very wet soils and moist situations will not suit it. It prefers a light rich soil in warm sunny situations, when grown in the open air. When grown in pots in a cold frame or house, it is most useful, producing, from August till October, long branching spikes of the purest white, the flowers lasting a long time in bloom, especially if the dying stems be cut off, which will cause the plant to produce fresh spikes. The white spikes of flowers are of great value for floral decorations, and can be used with great advantage in bouquets. *F. sonchifolia*, the Sowthistle-leaved Francoa, is very similar in growth, but has rose-coloured flowers. Both are well deserving of cultivation, the former especially.

Funkia.—This represents a genus of handsome-foliaged plants, comprising some of the most ornamental in cultivation. Their noble aspect, elegant outline, and bold Palm-like foliage, render them exceedingly attractive, either for pot-culture or for planting in the open air; they also form grand objects for exhibition purposes. There are a number of kinds, differing materially in the character of their foliage and the colour of their flowers, and all are worth cultivating. A few of the best are *F. Fortunei*, the Plantain Lily, and its handsomely variegated form; *F. ovata undulata*, the White-margined Funkia, the pale green leaves handsomely margined with white; *F. Sieboldi* and its variegated form; *F. spinosa*, with its slender graceful spikes of pure white flowers, produced in great abundance. For cutting purposes this can be strongly recommended; also *F. subcordata*, frequently grown as *F. grandiflora*, a noble-foliaged species for summer decorations, and a grand flowering plant for autumn; but as it flowers so late it should be lifted and placed in a cold conservatory until it has done blooming; the blossoms are large, pure white, and slightly scented. It can be had in bloom in November and December. All the Funkias should be planted in a generous sandy loam.

Gaillardia aristata grandiflora (*natural size*).

Gaillardia.—This also is a most useful genus of hardy decorative plants, more properly classed with the biennials, easily grown, and readily increased by cuttings or by seeds. Some are single-flowered; a few of the newer sorts have double blossoms. The prevailing colours are yellow, orange, or fiery-red, and black; and the flowers are large, bold, and showy. One of the best known is *G. picta*, and of this there are a few varieties differing somewhat in colour, but all equally useful. *G. hybrida splendida* is one of those things that should be in every garden; it is so free, striking, and effective. One of the best also is *G. aristata grandiflora;* this has a more perennial character than any just named, and it produces large numbers of blossoms from early summer till late in autumn. The flowers are fully three inches in diameter, and crimson, orange, and yellow prevail. The best double form is a variety of *G. picta*, named *Lorenziana;* the flowers are completely filled up with quilled florets. This, when grown from seed, is found to vary somewhat, but all the varieties are very pretty indeed. They do well in any good garden soil, but a sandy loam is preferable. The Gaillardia is a plant that can be successfully grown in pots, and treated in this way is found very useful for greenhouse decoration.

Helleborus (*Christmas Rose*).—A more useful group of hardy plants can scarcely be imagined

than the Christmas Roses. It is a family of plants that has been greatly improved and added to in the past few years. The Christmas Rose, or *Helleborus niger*, is so called because it blooms at Christmas, and its flowers open like a Rose, and is also called the Black Hellebore, because of the colour of its leaves. The Hellebore has long been considered a plant of evil omen, growing in dark and lonely places; but its blossoms are particularly bright, cheerful, and acceptable at the dead season of the year. As many of the Hellebores flower so early, their value for decorative purposes or for cutting from cannot be over-estimated; they are thoroughly hardy and very easily grown, and cannot be too highly recommended. For cutting purposes in mid-winter, the varieties of *H. niger* are invaluable, and should be grown by every one. It is a good plan to plant a bed with them, and then to place over it a frame in November or December, or as soon as they begin to show for flower; this tends to keep the

HELLEBORUS NIGER.

flowers clean, and improve their quality. Of *H. niger* there is the common variety in which the flowers come tinted with rose: *niger angustifolius*, known also as St. Brigid's Lily, the flowers of snowy whiteness, and produced with great freedom; and *maximus* or *altifolius*, the Giant-flowered Christmas Rose, the flowers larger than the type, white, and very free.

The following are a few of the most distinct of the genus:—*atro-rubens*, bright rosy-purple; *colchicus*, the latest to flower, the blossoms appearing in April and May, the flowers of a deep rich plum-colour, more or less spotted; *orientalis*, in variety, of which there are several fine forms: one of them, *odorus purpurascens*, purple heavily veined with dark lines, being one of the earliest to flower, and very free.

Some amateurs find difficulty in cultivating the Christmas Roses. We find that they do well in a good yellow loam, on a border facing the east. They need a generous soil, in which they can root freely and deeply, and they should be occasionally mulched with manure. For growing in pots we find *niger angustifolius* to be the best. Our practice is to lift the plants in October, as soon as the flower-buds begin to show themselves, placing them in pots just large enough to take the balls of earth, and ramming some soil well above them, and then placing them in an ordinary green-house, where they flower freely at Christmas time. But the plants flowered one year should be placed in the open ground again as soon as they have done blooming, and be allowed to rest one winter. Thus it is well to have two groups of plants, one flowering in pots, the other remaining in the border and blooming in the open air.

Hemerocallis (*Day Lily*).—This is a bold and handsome genus of hardy perennials, termed the Day Lily because the flowers, which are numerously produced, last so short a time. The plants form large tufts of long, broad, sword-like leaves, and produce clusters of Lily-like flowers; exceedingly useful for cutting, while the variegated forms make fine subjects for exhibition purposes. They should be planted in a shady border in good soil, and then left alone, and they will be found to do well, and the clumps should be allowed to remain undisturbed for years.

The following comprise the best of the family:—*H. fulva flore pleno*, flowers bronzy-yellow, very large and double; this is one of the best. *H. flava*, flowers golden-yellow; very fragrant. *H. japonica*, flowers soft yellow and bronzy-orange. *H. Kwanso flore pleno*, another form of *H. fulva*, with large double flowers of a rich bronzy colour; and this same variety, with handsomely variegated foliage. They well deserve a place in the garden on the margins of shrubberies, where they can enjoy the shade of trees during the hottest part of the day.

Hesperis (*Sweet Rocket*, or *Dames' Violet*).—Hesperis is from *hesperos*, "the evening star," Rockets being sweeter towards the evening. The name Rocket is given to several different plants, the most noted of which is "the London Rocket (*Sisymbrium Irio*), which is said to have first appeared in the metropolis in the spring succeeding the Great Fire of London, when young Rockets were seen everywhere springing up among the ruins, where they increased so marvellously that in the summer the enormous crop crowding over the surface of London created the greatest astonishment and wonder." But the name Rocket appears to be of very ancient derivation, and it is not made clear why it was originally applied. Our garden Rocket is *Hesperis matronalis*, or the Matronly Hesperis, which has been in cultivation in this country for many years. Seeds of the single purple, and the single white, are sold at the seed-shops, and they make charming hardy perennials, flowering early, and being very fragrant. The double varieties are among the choicest of our hardy perennials; they are the double purple, the double French-white, the flowers of which are creamy; and the old English double white, the flowers pure white, the spike of bloom dense and compact, but it is somewhat scarce.

The double varieties bloom from May until August. They are a little difficult to manage, especially in old gardens and confined situations; they do best in fresh soil—a good sandy loam—and an open situation. And the plants should not remain too long in one place; if they do, they not unfrequently dwindle away. It is recommended that the plants be taken up and divided every second year soon after they have done flowering, say early in autumn, and be re-planted in fresh soil. Though the single varieties seed freely, the double kinds do not, and it is only by division that they can be increased.

The garden Rocket boasts of many old-fashioned names besides those mentioned: viz., Damask Violet, Queen's Gilliflower, Winter Gilliflower, &c.

Heuchera.—This genus is named after Professor Heucher, a German botanist, and represents a group of hardy herbaceous perennials. They are grown more for their leaves, which are very ornamental, and they generally succeed well in good garden soil. *H. glabra* is a North American plant, with pretty leaves, that are very useful for cutting from for floral decorations; the flowers are white, and not

very ornamental. *H. ribifolia* is the Currant-leaved Heuchera; the peculiar dark tone of its leaves makes it a very useful bedding and edging plant. Both these grow freely in almost any soil, and can be propagated by root-division. *H. lucida* has leaves the size and shape of those of a Zonal Pelargonium, velvet and olive, and is also a very useful plant to cut from. It grows freely in good garden soil. *H. Menziesi* is a graceful little North American plant, with pretty flowers, but does best in a shady bog bed. The most beautiful of all is the recently introduced *H. sanguinea*, a native of Northern Mexico, with graceful panicles of deep red bell-shaped flowers.

Hypericum (*St. John's Wort*).—This genus includes hardy biennials, hardy deciduous and evergreen shrubs, and a large group of hardy herbaceous perennials. We have to deal with a few of the latter. The common St. John's Wort is a well-known plant. It is *H. perforatum*, and it has leaves marked with red, blood-like spots, which, tradition avers, always appear on the 29th of August, the day on which St. John was beheaded; but the plant derived its name from its being, according to ancient custom, gathered with great ceremony on the eve of St. John's Day, the 24th of June, to be hung up in windows as a preservative against evil spirits, phantoms, spectres, storms, and thunder. It is a plant that will grow well under the shade of trees, and is often used for covering the base of shrubberies and plantations. *H. balearicum* has leaves spotted with white, and yellow flowers. *H. calycinum* is the Great St. John's Wort, and sometimes called the Rose of Sharon; it is a very showy, low-trailing shrub, and though a native of Southern Europe, has become quite naturalised in Britain. It grows freely in any ordinary garden soil. *H. Coris* grows in evergreen tufts, and produces bright yellow flowers in loose panicles. *H. nummularium* is a dwarf creeping species, also with yellow flowers, and makes an excellent rock plant. *H. olympicum* is very pretty, bearing numerous bright yellow flowers, which are produced in rapid succession for about two months; it is perfectly hardy, and a very showy and attractive plant. *H. patulum* has slightly drooping branches, terminating in clusters of large, bright, golden-yellow blossoms. *H. triflorum* is perhaps the best of the family, forming bushes two to three feet high, composed of long, slender shoots, terminating with large, bright, golden-yellow flowers, whose weight causes the stems to gracefully droop towards the ground. It is a native of Java, but its thorough hardihood needs to be put to the test. *H. patulum* is also known under the name of *H. uralum*.

All the Hypericums are easily propagated by division of the roots, and are most useful for clothing vacant spaces.

THE HARDY FRUIT GARDEN.

By D. T. Fish, assisted by William Carmichael.

THE PEAR.—PRUNING AND TRAINING.

THE general principles and practice of these are much the same for Pears as for Apples, which have been rather fully treated at pages 320 to 326, Vol. II., and pages 14 to 22, Vol. III. Some of these principles may have to be slightly modified or altered when applied to Pears. For example, all that has been written of the importance of the root-pruning of Apples becomes still more imperative as applied to Pears on their own roots. But it must be borne in mind that no amount of root-pruning will make Pear-roots as fibrous as those of Apples.

In the case of double or multiple grafted trees little or no root-pruning is needed. The foreign cylinders, of differing diameters and varying degrees of porosity or sap-conveying powers, introduced between the roots and tops of the tree, check and reduce the supplies of fluid and food, and starve the tree into fertility. This was the theory of all the old systems of ringing, by ligatures, excision of sections of bark, burning with hot irons, &c. The practices seemed barbarous, but being nevertheless philosophical, they resulted in fertility; though it was often purchased at the price of the health, or even of the life, of the Pear or other fruit-tree operated upon.

Again, in the case of orchard trees or groups in woods, or pleasure-grounds, or lines by the sides of roads or walks, that are intended to grow into full size and last for years in a fruitful condition, the less pruning they are subjected to, either at root or top, the better for their picturesque beauty, and permanent health and fertility. If such trees could be grown, worked, or planted as maidens, where they were to stand permanently, it would be all the better for them. Sterile soils and subsoils, sharp stones, virtually impenetrable strata, not unfrequently prune or starve the plants into fertility far more effectually than the impatient methods of the cultivator. The exigencies of space, the modern idea of concentrating a maximum number of Pears into the smallest possible area, and gathering them in the least possible time from the bud or graft, render much pruning and laborious training needful. But with more time, wider areas, larger trees, nature can do her work well without our aid, and in spite of our hindrances.

Top-pruning, and Training.—See Apples, Vol. II., p. 320; Vol. III., pp. 14 and 22. The idea of pruning the tops of Pears into fruitfulness is still more hopeless than with Apples. It was tried

for centuries and failed. The more they were cut back the faster and stronger they grew, and it was this severe pruning that gave rise to the now meaningless old saw, "He that plants Pears, plants for his heirs."

Summer Pinching.—The chief novelty about this is its repetition twice or oftener a year (see Apples, Vol. II., pp. 323, 324). This is all very well under glass, in orchard-houses, or on very warm walls, but is hardly safe in the open air, anywhere in England, unless in the warmest and driest districts. It not unfrequently happens that the often-stopped shoot proceeds to break all its reserved force of buds, and looks more like a bunch of greens at the end of the year than a promising Pear-shoot. So alive were the old fruitists to the evils of the premature breaking of these reserves, or succession buds, that they ofttimes hesitated to stop back the current shoots, or cut off the breast-wood. By tying down, or breaking almost wholly through the breast-wood of Pears, about the middle of June, or early in July, the trees presented the appearance in Fig. 38, and the buds were kept from breaking out of season.

Fig. 37.—Excessive Fertility of Pot-tree caused by constant Pinching.

The practice of pinching, however, concentrates force as well as hastens and heightens fertility. See Fig. 37 as an illustration of a persistently pinched Pear-tree in a pot. In this case, however, there were other fruit-producing influences at work, notably the smallness of the pot to the size of the plant, the violent compression of the roots, and the necessary scarcity of food. Add to these physical causes, the superior climate afforded by the sunny side of a glass-house until the end of May, and the semi-roasting site of the southern side of a south wall throughout the summer and autumn. Under these conditions, and with the strain of a heavy crop in addition, but little wood was made; and when that little was pinched at every third leaf, the buds plumped up into fertility, and added to their size and hardness throughout the season. This example may be looked upon as fertility carried to its utmost possible limits.

But pruning and training are equally or more necessary for moulding Pear-trees into form than for intensifying their fertility. The Pear naturally affects the conical or pyramidal form. But without considerable summer pinching or winter pruning it is apt to climb too fast and too far, the result being that the trees are prone to become slim at base, top-heavy above. This radical evil may be readily prevented by careful stopping of the leaders and side shoots.

Pinching or Stopping the Centre of Pyramids.—In the majority of illustrations of pyramidal trees the leader or centre stem looks as if it had never been stopped. This is, however, very far from being the case. On the contrary, the secret of success in the moulding of such trees into symmetry and perfection lies in one, two, or more stoppings a year. By thus losing to win, the progress of the tree is greatly hastened and accelerated. A yard in height may now be made good all round instead of the old orthodox foot. The earlier the stopping takes place, the more may be done within the year. Suppose the shoots are stopped early in June, the second shoots will be sure to have become sufficiently ripe before the end of the season. Those, again, who apply three or five-leaf measure to the leading as well as the side shoots of their Pears, may make far more substantial progress in furnishing their trees with side shoots, and in many sites and localities the progress is very rapid.

Overcrowding of the branches is one of the greatest evils in modern Pear-culture. The trees being placed so much more closely together, five-and-twenty or more trees now occupying the area devoted to five only a few years since, there is the less excuse for overcrowding the branches. To prevent this, it is well to start with a system, and rigidly adhere to it. It is found in practice that five side branches to each central break or stoppage of the leader favours the formation of a good pyramid. In fountain-formed pyramids, tiers of branches are brought out from the centre stems at regular intervals, as squirts of water proceed from the upright shaft of a fountain. The branches may either be led out at almost right angles from the stem, or droop back towards the ground in somewhat the same way as the spray of water returns to the basin. Weeping pyramids differ from the fountain in being less regular, more picturesque, and yet equally fruitful and beautiful. Considerable trouble is needful at first to tie, peg, or weight the branches into a drooping direction. But once this is done

there is no means equal to keeping them in form like an annual crop.

Some Pears, such as Marie Louise, Winter Nelis, and others, lend themselves much more readily to this mode of training than others. There are no sights within the whole range of pomology more satisfying than a row of such shaped trees in full bearing.

Two common laws of proportion which may be accepted as canons of beauty among pyramidal Pears, are that the height shall equal the circumference of the base, and that a section of the side should taper regularly from the base to a point at top. But after all, perfection of form in Pears is of far less moment than perpetuity of fertility, and the best means of maintaining the latter must now be briefly adverted to.

How to Keep the Side-shoots of Pyramids in Full Bearing.—What is here added to our pruning and training of Apples will, it is hoped, prove sufficient to produce and maintain perfect pyramidal and other shaped Pear-trees in perpetual fertility. But living trees in general, and Pears in particular, in the garden, differ widely from Pear-trees on paper, in this, that they are always striving to get out of shape; to avoid fertility, or sink under the restrictions and burdens we impose on them. For example, we wish the diameter of the base to exceed that of any other part of the pyramid, and its vigour to increase rather than diminish. The vital force and natural habit of the tree will it otherwise, and hence various means are used to sustain the strength of the bases of Pear-trees, and suppress the vigour of their tops. Among these the simplest is to elevate the base branches, relieve the bottom of the tree of a considerable proportion of its fruit, and suppress the top by vigorous summer pinching, tying down the branches, and heavy loads of fruit. All overcrowding must also be prevented among the side branches, the most vigorous and highest-placed shoots be summer-pinched, twice or oftener, when weaker ones need not be pinched at all, and all small and useless buds be rubbed off or pinched back to a single eye, with the hope that such eye may finally develop into a fruit-bud or cluster of buds. Everything, anything, in the form of growth, whether of leaf, shoot, or fruit, not likely to be of use, should be removed so soon as practicable, so as to relieve the tree of all useless encumbrances, and expose the material left to the full influence of light and air. The earlier in reason all this removal of weakly or useless material takes place the better. It should begin by disbudding, a process persistently prosecuted among stone fruits, and often wholly neglected among Pears. On the heels of disbudding should follow summer pinching. This may be more freely practised on the side or lateral than the leading shoots of Pears. Strong shoots, especially on the higher portions of pyramids, should be pinched at the third, fourth, or sixth leaf, while other or weaker shoots, lower down, need not be pinched at all. A general stopping of all the side shoots should take place not later than July.

Fig. 38.—Inducement of Fertility by Bending and Breaking down Branches.

Best Time and Mode of Winter Pruning.—Opinion and practice vary widely in regard to this. October, or just before the fall of the leaf, seems the best time to prune Pears, for several reasons. The first is, we can then see far better what to prune, and how many branches to cut out. No sooner do the leaves fall than the trees seem so much thinner of wood than they are. Another reason is that wounds heal quickly when made before the fall of the leaf. Modern culture, while it has multiplied the number of wounds made, has lessened their size so much as to make this a matter of less moment than when whole branches were often butchered off under the name of pruning. Still, it is important that the wounds made by pruning should heal as soon as possible, as the frost is apt to split raw or fresh wounds, and wet thus gets into the pith, to the production of canker or other diseases. But with proper summer pruning, pinching, disbudding, but little autumnal or winter pruning is needful. An advance of a foot in height and from four to six inches in breadth a year, is a fair and satisfactory development for established Pear-trees in full bear-

ing. Such fructiferous varieties as Louis Bonne of Jersey will frequently not advance more than two inches a year either in height or breadth.

In cutting back the leading shoots of Pears, either in the autumn or winter, they should be cut to a bud, as near as may be in a line with the main stem. When this is attended to, established Pears show few or no signs of the frequent beheadings to which they have been subjected, and may be as perfect in form and have as clean straight stems in the garden as on paper.

Neither must cutting back to a bud be interpreted too literally. It is safer to make these cuts a quarter of an inch, or even a half-inch, above the bud, and when the latter is strongly started, towards the end of the succeeding April, cut this bit of protruding wood off at a sharp angle at the base of the growing shoot. The wound will then heal quickly, and the leader be kept clean as well as straight.

Bush Pear-trees.—There is but little to say about these, only that, as a rule, they are mostly less regular and a little more rugged than our bush Apples (p. 18, Vol. III.). But unless for Pears under glass, or made portable by pot culture, the bush culture of the Pear needs specially favourable sites and localities for its successful prosecution. When bush Pears are attempted, those on the Quince, or double-grafted, or rooted cuttings, the cuttings taken from trees already in full bearing, are likely to be the more successful. (See Pears, in THE ORCHARD-HOUSE.)

Best-formed Pear-trees for Walls and Espaliers.—As a rule, horizontal-shaped trees of various sizes and forms are those most generally used, with or without a straight or twisted centre stem, with an open centre, or two furnishing rods.

A great point in this mode of training is the direction of the lower branches at first, so as to give them a strong start somewhat in advance of the others. Once this is secured it is mostly kept, and one way of securing it consists in raising the shoot somewhat above the horizontal lines during its first season's growth.

The fan system of training is more difficult and also more mobile than the horizontal. Admirable as the latter is, it is obvious that should a limb or large branch succumb, the symmetry and beauty of the tree is marred for years, if not ruined for life. Culturally the merits of the two chief modes of training Pears may be pronounced of equal merit. Most Pear-growers, however, prefer the horizontal for walls and espaliers. But, structurally, the fan system is the best. The branches all radiate from the root-stock, or stem of the tree, near its base, and spread out like the limbs of a fan towards the sides and the top of the wall, and hence the name. And it is obvious, were one of these to fail, a very slight shifting of the remaining ones would suffice to fill up the blank, and thus re-mould the tree into perfect form.

To furnish fan-shaped trees with fruit-spurs, the leaders must be stopped, or pinched back during the process of growth, so as to furnish sufficient breaks on the sides to be developed into fruit-buds. And as the tendency in fan-shaped trees is to throw most of the strength into the centre, it is well during all the preliminary stages to keep the centre of the fan open. This will enable the sides to be well developed before the centre is filled. There is never any danger of not finding material in plenty to furnish the latter when desired.

General Treatment of Breast-wood on Horizontal and Fan-shaped Trees. — This does not greatly vary from that so carefully described for pyramidal trees of various forms and sizes. Only trees on walls and espaliers having fewer branches, being in fact more of skeletons than trees, need more frequent stopping and vigorous suppression. The centre of fan-shaped trees may also need more stopping than the sides. Again, espaliers being smaller, seldom more than six feet high, will probably require more frequent pinching and stopping than wall trees, which are mostly allowed to run further and climb higher. Much will, however, depend on the stock and the treatment, and more especially on root-pruning. The main branches on espalier trees should never be closer than six inches; nine inches is preferable, and some adhere to a foot on espaliers as on walls.

It is obvious, however, that Pears may be closer on espaliers than on walls, and for the self-same reason, to keep them warmer. The bare interstices on brick walls are warming-pans for the Pears. The open spaces in espalier rails are cooling ventilators for the reduction of temperature. Hence the wisdom of placing the branches of Pear-trees on espaliers so closely that when fully furnished the whole should form almost a living wall of verdure, in which the branches, leaves, and fruit-spurs should well-nigh touch each other. As light and air have free access to the trees on each side, and the trees themselves are but single-branch thick, it is obvious that the whole tree may be converted into a verdant or fruitful screen with comparative impunity.

The closer the branches, however, the more severely the fruit-spurs must be reduced, alike in size and numbers. A safe and most profitable mean distance between fruit-spurs, or nests of spurs, is that of six inches. In such exaggerated cases of fertility as that illustrated in Fig. 39, the joint products of

persistent pinching, pot culture, and growth under glass, unless the spur is severely cut back as shown by the lines, such enormous fertility is likely to deteriorate the fruit into comparative worthlessness, as well as to destroy the vigour and end the life of the tree.

But such illustrations of fertility are given as warnings rather than examples. Fig. 40 is a more normal example of the fertility forced by judicious pinching and stopping of the ordinary lateral shoots or bearing wood of the Pear, whether trained in horizontal, fan, or other fashions.

This shoot was stopped at the third leaf, as it broke into excessive vigour (see 1). It was then permitted to make five leaves. When stopped at 2, its strength was not only greatly reduced by the second stoppage, but likewise by the diversion of the sap into two shoots of almost equal strength. Now supposing this shoot needed for furnishing a vacant space, it may be laid in full length, and has five buds on it. But if only needed as a fruit-spur for permanent fertility, it may be cut off at the dotted line at the winter pruning. After a time the one or two spurs thus left will become the nucleus and develop into a nest of spurs as already illustrated in Fig. 39.

Fig. 39.—Exuberant Group of Fruit-spurs.

At times, however, these various pinchings result in the production of wood only. In such cases the entire series of growth may be cut back at the winter pruning to a point near the base of the shoot, somewhere below No. 1. This wholesale and severe cutting back is technically called keeping the wood and fruit buds at home: a point of more moment on walls than on espaliers, as when fruit-spurs get away beyond six inches of the wall surface they have already lost much of the fostering warmth of the wall. Hence the general practice of cutting back the breast-wood, that is, the annual lateral growth of Pears, to within an inch or so of the main branches in the autumn, unless the formation of fruit-spurs renders such close pruning imprudent or impossible. For after all it is impracticable to prune by rule only and wholly, and it must never for a moment be lost sight of that the great and most vital object and design of all training and pruning is to prune for fruit.

This has led to the adoption of what may be correctly described as the free-and-easy method of training Pears over espalier rails. The result of this is very similar to what would occur were a weeping pyramid divided into two halves, and each backed from the cloven centre against an espalier or wall. The line of Pear-trees would then form a series of vandykes all along the front of the wall, the centres bulging out a yard or so, the sides retreating up to the wall where the trees meet each other. Supposing the centre is reduced a half or so and the meeting-places expanded, the whole wall surface would be furnished with Pear branches, leaves, and fruit, to a depth of fifteen, eighteen, or more inches. In furnishing espaliers in this way the preliminary steps may be identical with those already recommended. Lay the foundation of the trees, that is, their leaders or ribs, just the same, and then droop or distribute through these the fruit-bearing spur-clusters or twiglets as thought best. This mode of training is more difficult than the more formal methods. But once trees are thoroughly provided with bearing wood, and especially so soon as they get into full bearing, but little pruning beyond what may be needed to prevent overcrowding, and for the removal of weakly or useless shoots and spurs, will be required.

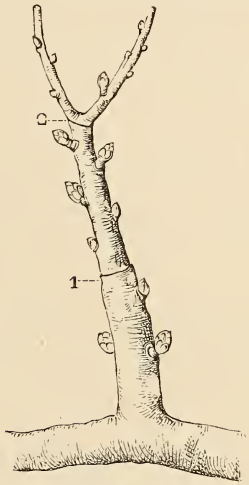


Fig. 40. — Pruning of a Fruit-spur.

The pruning and training of cordon Pears does not differ much from that of Apples. (See illustrations and description of the latter, Vol. III., pp. 15, 16.) There are, however, several other forms more generally used for Pears than the single and double diamonds and special cordons already described. Among these the single, double, vertical, oblique, U or V-shaped, and five-branched cordons are the more generally used.

Iron is often used, when the standards may be six feet high, and the wires nine inches apart. The end standards are made of angle iron with self-

fixing bases, and at intervals of two feet intermediate standards with pronged or anchor feet are placed to keep the wires in shape, and keep the whole steady. Occasionally much stronger straining posts are needed, and also an angle or round bar at top or bottom to give additional strength. Strong Bessemer steel wire of No. 7, or even thicker gauge, is also often used. But really when well erected, and the wire strained tightly, it is astonishing how strong and immovable these wire espaliers are. A caution should, however, be given against the indiscriminate use of galvanised wire or iron. It seems almost certain that this proves at times injurious to the wood, either originating or aggravating canker. Hence the safest material for espalier frames is common iron or wire, carefully coated over with coal-tar or some other equally good or better varnish.

Three and four-branched cordons are far more common in France than in this country. Very fine examples of the latter were seen by the writer in the old fruit garden at Versailles. They run, however, very close to horizontal or vertical-trained Pear-trees, and the five-limbed form used to be a favourite one for the training of Gooseberry and Currant bushes on walls many years ago. All the forms are equally useful for the furnishing of walls or espaliers. And the treatment of Pear cordons does not differ much from that of Apples, already described. The limited area of these small trees, and close proximity of their tops to their roots, places them more completely under the control of the cultivator, and hence their whole surface should be one cord or rope of fruit from base to summit. One branch out of many on horizontal or fan-shaped trees more or less scarce of fruit may be tolerated, but to concentrate a tree into one, two, or at most a very few stems, and leave a part of one or more of these bare of fruit, is not to be endured.

For the pruning and training of standard and bush Pear-trees, see Apples, Vol. III., p. 21. Pears, however, require rather more attention, and many of the varieties require rather different treatment to Apples. The tendency to run into pyramidal forms has several times been referred to, and this tendency should have full freedom in the growth of Pears. Very few varieties, without an immoderate amount of training, could be forced into round-headed trees. And there is no benefit, but the reverse, in attempting to force Pears into such shapes. For standard and dwarf Pears it is better to let the centre have and keep a head, so far as to make the whole of the side shoots diverge from it in graduated heights, somewhat in the way, though with less formality than already described for the formation of pyramids.

General Culture of the Pear. — This does not greatly differ from that of the Apple, already so fully described. But being rather earlier and more tender, the Pear needs more protection against spring frosts. On walls and espaliers this is easily given, by nets, canvas, mats, boughs, paper, &c., oiled or otherwise. On the whole, nothing is so efficient as a few Spruce, Fir, or other boughs or branches. A few of these placed over the trees thinly as they are coming into blossom will mostly suffice to carry them safely through the frosts of spring. Pyramidal and cordon trees are often protected by means of impromptu umbrellas, made of bunting or old newspapers, or common brown paper. It is astonishing how efficient such flimsy protections are, especially in dry still weather. And it is during such weather that the cold proves most destructive.

Pear cordons, run along near the ground, may be very safely carried through spring frosts by placing a foot deal or plank, or a few dry bricks, on either side of them, and covering the distance with squares of glass. But these are mere suggestions of the many methods by which enthusiasts in Pear-culture carry their trees safely through our trying springs, and obtain a good crop, while others fail. Coping projections over the walls, from four inches to eighteen wide, composed of glass, reeds, boards, boughs, slate, stone, &c. &c., are some of the more ponderous and permanent methods of protecting Pear-blossoms on walls, and, by skilful arrangement, espaliers likewise.

Soon after the setting should come the thinning of the fruit. It is a mistake to wait to see what nature will do first. Nature, by grasping at all, not unfrequently loses all. Hence the cultivator should assist nature early to retain the finest-formed, best-posted Pears for final selection. On fertile trees, and in good seasons, nature will probably elect at least ten times more fruit than the tree should be allowed to carry. Hence the importance of following swiftly with thinning on the heels of setting. All the worst and the smallest should be removed, and then thin the good fruit to a moderate crop, allowing as many again, or three to one, small Pears, such as Winter Nelis, as against Marie Louise or Williams' Bonchrétien.

When thinning the fruit it is good practice also to thin out or disbud all small useless branchlets, and any small leaves where they crowd up and smother finer or better ones. In parts of the tree in which fruit-buds or spurs may be scarce, these may be produced to a great extent to order by stopping back the shoots to a single eye at their base. But the great object in the removal of superfluous shoots and leaves is to more fully expose to light and air the fruit, spurs, and foliage left.

During the Swelling Period, Pears should, as far as possible, be protected from any check, either at root or top. Sudden changes of temperature are almost beyond our control, but these are less injurious than great alternations of drought and moisture, and it is chiefly these that result in that most trying of all phases in Pear-culture, the cracking of the fruit. A good mulch, and a frequent soaking of sewage at the roots, and a daily syringing overhead, about 5 p.m., during hot dry weather, are among the surest antidotes to Pear-splitting.

Ripening.—As the Pear approaches maturity all stimulating treatment at root or top must be withdrawn. If the summer pinching and stopping have been attended to as directed, the fruit will be fully exposed to light and air. Leaves may be manipulated, or even removed, if needful, in moderation, in pursuit of the final process of maturing the fruit in perfect condition. The more light and air the higher the colour, and the fuller and more luscious the flavour.

The finer the fruit is, the more carefully it must be guarded against birds and wasps. The mere touch of either proves fatal to their perfect finish or keeping. It is less what they eat than what they destroy by touching that makes these pests so troublesome in the Pear garden. Unfortunately, the very lusciousness of the fruit gives forth the news far and wide that something good is going, and the insect pests come in swarms at the odoriferous call of the luscious Pears.

Many means have been devised to protect the fruit, and keep out the pests by fine-meshed nettings or muslin bags, or destroying them. None are half so effective, simple, and safe as the prompt gathering of the fruit. As soon as the luscious odour proceeds from the fruit it is sufficiently ripe to gather, possibly over-ripe, and already hung into mellowness. Now a mellow Pear is a Pear already *passé* to connoisseurs, and there is, therefore, no need to leave Pears on the trees to hoist high and far and wide to all destructive pests the odorous signal.

Gathering and Packing of Pears.—Ripe Pears cannot be too carefully handled; flat baskets, only to hold one row of fruit, are best, and in these they should be carried to the fruit-room and laid on shelves single file. But in packing for market it is impossible to adopt this system, and the next best thing to do is to bottom the basket with soft hay or moss, fill it as full as possible with fruit as gathered, sprinkle a slight litter of the same material over the top, and fix firmly down, and despatch at once. Pears thus packed will mostly arrive at market nearly as fresh as they left the trees. It is the frequent removals that make the saddest havoc among Pears and other fine fruits.

Sorting and Storing the Fruit at Home.—The sorting is almost the most important. Each sort should be placed at once where it will remain until consumed. A few sorts, such as the Citron des Carmes, and the Jargonelle, are so sensitive and so perishable that they should hardly be stored. They are best eaten off the trees. For the rest, the early, mid-season, and late Pears should all be stored in groups by themselves, and there is no better way nor place than on an open shelf in a fruit-room, cool and dry, that is, commanding as nearly as may be a temperature of 45° summer and winter.

Storing in drawers, jars, &c., may also be practised for the winter and spring varieties if preferred. But the jars and drawers should be empty of all else but Pears. No paper, moss, hay, sand, nor soil, nor salt, only clean sweet drawers and jars or flower-pots filled with chosen fruit, and covered over with earthenware or other tops. But shelves are better, as on these one can see at a glance how it fares with the Pears.

Culture of the Trees after Gathering the Fruit.—All unduly late growths should be pinched or cut off, any breast-wood left too long cut back, and having harvested one and the main crop, that of the fruit, every attention should be bestowed on the harvesting of a second, hardly of secondary importance, that is, the nut-brown fruit-buds, the Pears in embryo for next year, in an equally creditable state.

Varieties of Pears.—Though less numerous than Apples, these are very numerous. The old pomologists used to divide their catalogues into tame Pears and wildings, and both did not number a score. Soon, however, they mounted up to fifty, and early in the sixteenth century to one hundred, two hundred, and three hundred. In the seventeenth century less increase was chronicled; early in the nineteenth century, over four hundred; and in 1831 the number of Pears described in the catalogue of the Royal Horticultural Society of London was over six hundred. Within the last half-century the number of Pears has increased, until now it is supposed there may be three thousand varieties in cultivation, and some of our largest growers cultivate as many as a thousand sorts. Pear-trees of different varieties run into almost every variety of form, from something like the narrow spire of the Lombardy Poplar, to the broad umbrageous sweep of the round-headed English Oak. Among other recent Pears worth a trial besides those named are Lucy Greive, Duchesse de Bordeaux, and Mdlle. de Potolange.

Select List of Pears.

Belle Julie—fruit medium size, flesh yellowish, buttery, and very juicy; highly perfumed; a valuable early sort. In use October.

Bergamotte Esperen—fruit large and handsome; a most valuable late sort and richly-flavoured. The tree is a great and constant bearer, and succeeds well on the Quince. It ought to be grown on the wall. In use February or March.

Beurre Benoit—fruit large and handsome; a most delicious sort. It deserves a wall either south or west aspect. September and October.

Beurre Giffard—fruit medium size. One of our best early sorts; melting, juicy, and perfumed. August.

Catillac—fruit large. One of the best stewing sorts, and bears freely as a standard. December to April.

Comte de Lamy—fruit medium size, exceedingly rich, sugary, and highly-flavoured. October.

Conseilleur de la Cour—fruit large, melting, and excellent. The tree bears freely on the Quince. October and November.

Dourondeau — fruit large, handsome, and beautifully coloured, melting, sweet, and richly-flavoured. The tree is a most prolific bearer, and forms a fine pyramid on the Quince. October and November.

Doyenne d'Alençon—fruit medium size, flesh melting, and rich; a very valuable late sort. The tree is a good grower, and bears abundantly. December to March.

Doyenne du Comice—fruit large; a noble sort, of exquisite flavour. The tree forms a fine pyramid, and succeeds well on the Quince. October and November.

Doyenne Robin—fruit medium size; a most delicious sort, of exquisite flavour. The tree is a great bearer, and forms a fine pyramid. October and November.

Easter Beurre—fruit large, buttery, melting, highly flavoured. It requires to be grown on the wall, and remain on the tree till the end of October. In use January to March.

Fondante d'Automne—fruit large, handsome, melting, juicy, very sweet, and highly perfumed. The tree forms a fine pyramid on the Quince, and bears abundantly. October.

Golden Beurre of Bilbao—fruit large; a most beautiful and highly-flavoured sort. September to October.

Gratioli of Jersey — fruit large, melting, juicy, very sweet, and highly-flavoured; a very valuable autumn sort. October.

Huyshe's Prince Consort—fruit large, melting, very juicy, and deliciously flavoured; a remarkably fine sort; succeeds well on the Quince. End of November.

L'Inconnue (Van Mons)—fruit medium size, melting, very juicy, rich, and pleasantly perfumed; a first-rate hardy sort. In use end of January and February.

Jargonelle — fruit large; a well-known old summer sort; it bears freely if double-worked on the Quince as standards. The Pears may be eaten when gathered, as they do not keep long. August.

Josephine de Malines—fruit medium size; a most delicious variety. The tree is hardy and prolific; grown on the Quince; a valuable late variety. February and March.

Louise Bonne of Jersey—fruit large, and very handsome, buttery, melting, and finely-flavoured; one of the very best autumn varieties. The tree forms a good pyramid, succeeds well on the Quince, and is a great bearer. October.

Madame Treyve — fruit large, handsome, melting, and richly-flavoured; a valuable early sort; succeeds well on the Quince, and bears abundantly. September.

Marie Louise—fruit large, melting, and exceedingly richly-flavoured; one of the finest sorts known. The Pear hangs long on the tree; by gathering at different times, this valuable variety may be had from October till the middle of November.

Mary—fruit large, and very handsome, melting, juicy, and very highly-flavoured. This variety deserves to be well known; a most delicious variety, and a good bearer. October to November.

Olivier de Serres—fruit medium size, flesh buttery, sweet, and vinous; a good late variety. The tree bears well on the Quince, and forms a fine pyramid. February and March.

Pitmaston Duchesse—fruit large and very handsome, of the finest quality. The tree is a strong grower, and forms a handsome pyramid on the Quince a very valuable variety. October and November.

St. Michel Archange — fruit large; a noble variety, of exquisite flavour. In use September to October.

Thompson's—fruit medium size, melting; a delicious sort, of fine musky flavour. November.

Uvedale's St. Germain—a very large and excellent stewing variety. It requires to be grown on a wall. January to May.

Williams' Bonchrétien—fruit large, melting, and juicy, with a rich flavour, and powerful aroma. The tree grows well on the Quince, and bears abundantly; a well-known variety. August and September.

Winter Nelis—fruit medium size; a delicious variety, of great excellence. It requires a wall either of south or west aspect. December and January.

List of Hardy Free-bearing Pears Suitable for Growing for Market Purposes.

Alexandre Lambre (Nov. to Jan.).
Althorp Crasanne (Oct. to Dec.).
Aston Town (Oct. to Nov.).
Baronne de Mello (Nov.).
Beurre d'Amanlis (Sept.).
Beurre d'Aremberg (Dec.)
Beurre d'Assomption (Aug.)
Beurre de Capiomont (Oct.).
Beurre Clairgeau (Nov.).
Beurre Diel (Nov.).
Beurre Hardy (Oct.).
Beurre Superfin (Sept. and Oct.).
Bishop's Thumb (Oct.).
Brockworth Park (Oct.).
Broom Park (Jan.).
Citron des Carmes (end of July).
Doyenne Bussoch (Oct.).
Doyenne d'Été (end of July).
Duchesse d'Angoulême (Oct and Nov.).
Eyewood (Oct.).
Forelle (Dec. and Jan.).
Hazel (Sept. and Oct.).
Marie Louise d'Ecle (Oct.).
Suffolk Thorn (Oct.).
Swan's Egg (Nov.).
Vicar of Winkfield (Jan.).

Supplementary List of Pears.

Althorp Crasanne — October to December; pale green, with russety spots on sunny side.

Autumn Bergamot — October; one of our oldest and very best Pears.

Beurre Bachelier—December; large, handsome, and of fair quality.

Beurre Bosc—October and November; flesh white, melting, and buttery; best on a wall.

Beurre Rance — February and May; dark green, covered with russety dots; very fine.

Comte de Flandres — November to January; an excellent Pear; flesh yellowish, melting, and sugary.

Crasanne — November to December; greenish-yellow, dotted with grey-russet; very fine.

Flemish Beauty — September; pale yellow, almost covered with brown spots.

Gansell's Bergamot—October to November; greenish-yellow, covered with reddish-brown next the sun.

General Todleben — December to February; large, yellow, speckled with russet.

Glout Morceaux — December to January; first-rate—yellowish-green when ripe.

Hacon's Incomparable — November to January; yellowish-green, with a rich musky flavour.

Jean de Witte — January to March; yellowish, buttery, and melting.

Knight's Monarch—December to January; yellowish-green, suffused with russet; very good.

Maréchal de la Cour—October; very bright cinnamon-russet.

Napoleon — November to December; different and better than Napoleon III.; bright green, changing as it ripens to greenish-yellow.

Ne Plus Meuris—January to March; very excellent; dull yellow, overlaid with russet.

Swan's Egg—October; one of the finest, old variety.

Urbaniste—October; a delicious Pear; flesh white melting, and tender.

Selection of Pears for Different-sized Gardens and Particular-formed Trees.—At the risk of some repetition of names, we venture

to add some selections for particular purposes, merely giving the names of the different varieties.

BEST SIX PEARS FOR COTTAGERS AND AMATEURS.

Beurre Diel.	Marie Louise.
Glout Morceaux.	Winter Nelis.
Louise Bonne of Jersey.	Williams' Bonchrétien.

TWELVE VARIETIES.

The above six and the following in addition:—

Beurre d'Amanlis.	Josephine de Malines.
Beurre Rance.	Passe Colmar.
Easter Beurre.	Thomson's.

TWENTY-FOUR VARIETIES.

The above twelve and the following:—

Beurre de Capioumont.	Gansell's Bergamot.
Beurre Giffard.	Jersey Gratioli.
Beurre Hardy.	Knight's Monarch.
Beurre Sterckmans.	Ne Plus Meuris.
Doyenne du Comice.	Pitmaston Duchesse.
Duchesse d'Angoulême.	Vicar of Winkfield.

PEARS FOR WALLS.

The following, though they will do well as pyramids in warm localities, really do best with the aid of a wall:—

Beurre d'Aremberg.	Gansell's Bergamot.
Beurre Diel.	Glout Morceaux.
Beurre Rance.	Jargonelle.
Beurre Sterckmans.	Ne Plus Meuris.
Crasanne.	Passe Colmar.
Easter Beurre.	Winter Nelis.

And the finest kitchen Pear, Uvedale's St. Germain.

VARIETIES FOR ORCHARDS.

Aston Town.	Jersey Gratioli.
Beurre Bosc.	Louise Bonne of Jersey.
Beurre de Capioumont.	Marie Louise.
Broom Park.	Ne Plus Meuris.
Citron des Carmes.	Seckel.
Eyewood.	Suffolk Thorn.
Flemish Beauty.	Swan's Egg.
Forelle.	Thomson's.
Hacon's Incomparable.	Urbaniste.

And for kitchen use, the Catillac and Verulam.

As espalier rails are hardly warmer than orchards, the same varieties, with a few of the hardier ones, recommended for walls, will do equally well for these.

Among the best varieties for forming pyramids on the Quince are the following:—

Alexandre Lambre.	Duchesse d'Angoulême.
Beurre Bachelier.	Easter Beurre.
Beurre d'Aremberg.	Glout Morceaux.
Beurre de Capioumont.	Jersey Gratioli.
Beurre Diel.	Louise Bonne of Jersey.
Beurre Hardy.	Urbaniste.
Comte de Lamy.	Winter Nelis.

Most of these do almost equally well for bush culture or for cordons, to which the following may be added:—

Beurre Bosc.	Flemish Beauty.
Beurre Rance	Marie Louise.

Seasons.—Those who are fond of very early Pears will find a deficiency in our list. But hardly any of such are worth eating. The only July Pear really worth eating is the Summer Doyenne. At the end of July or early in August, comes the Citron des Carmes, a deliciously perfumed mixture of sugar and water, so perishable withal that it should be eaten off the tree, lest it lose the bloom of its rich aroma before it reaches the table. This Pear, on warm walls and on hot sheltered sites, is frequently ripe by the middle of July.

Coming into August, the Beurre Giffard and Jargonelle furnish a supply of good Pears. Early in September, Williams' Bonchrétien proves a host in itself throughout the month, and to those who enjoy perfumed Pears all others are tame and seem insipid beside the Bonchrétien. Towards the end of the month Beurre d'Amanlis comes in, and this is succeeded by Beurre Superfin and British Queen, the latter hardly worthy of its name, and not recommended by us. In October, good Pears become plentiful as Blackberries, the following among others being then in season:—Beurre Capioumont, Beurre Hardy, Comte de Lamy, Louise Bonne of Jersey, Marie Louise d'Ecle, Suffolk Thorn, Urbaniste. November brings in addition—Beurre Diel, Gansell's Bergamot, Doyenne de Comice, Marie Louise, Pitmaston Duchesse, Thomson's, and Mons. le Clerc. December—Beurre Sterckmans, Crasanne, Althorp Crasanne, Passe Colmar, Comte de Flandres. January—Huyshe's Prince of Wales, Chaumontel, Hacon's Incomparable, Beurre Bachelier, Glout Morceaux. February—Forelle, Winter Nelis, Josephine de Malines. March—Beurre Rance, Easter Beurre, Jean de Witte. April—Ne Plus Meuris. Some of these, notably the Easter Beurre, and a few other Pears, hardly of sufficient merit to be highly recommended, with careful storage will keep well through May, thus leaving but one month without Pears throughout the twelve; and this might readily be bridged over by growing a plant or two of the Citron des Carmes, or Summer Doyenne, under glass in the green-house, or even in a sunny window of a sitting-room.

Diseases and Insects.—Fortunately these are almost confined to two, the canker and the scale. Other diseases are sometimes met with under the very comprehensive name of blights, and not a few other names. But these two avoided or mastered, the Pear-trees will probably keep healthy and remain clean. The wild Pear is seldom subject to diseases or insects of any sort; hence it may almost be inferred that canker is produced rather by culture than climate; and doubtless it is so, or rather has been, for there can be no doubt that canker is greatly on the decrease, and may probably be wholly grown out; and, indeed, this is the only cure, for notwith-

standing the volumes that have been written on the cure of canker, it is really incurable when once thoroughly established. But prevention is better than cure; and canker may be, in fact has been, to a great extent prevented by modern methods of culture. It would also seem that some sorts of Pears have a constitutional bias towards it, just as certain families have towards the gout. Among such are the Golden and Brown Beurres, Jargonelle, and others; and these are worse in certain districts than in others; and wherever such examples are noted, let these Pears be wholly avoided in that particular locality, or tried under special conditions, such as on south walls or in orchard-houses. Other things must be avoided as well as cankerously-disposed varieties. Among these are stimulating, over-rich soils, severe pruning, excessive summer pinching, over-cropping and under-cropping—in a word, all that promotes excessive vigour, or, on the other hand, leads to exhaustion. Excessive vigour, however, and surgical operations on a wide scale to get rid of its results, have been the great producing causes of canker. The four chief causes, so far as known, of canker, are succulent growths, heat, frost, and wounds.

By avoiding the first, we prevent the other three from coming into operation, for no heat in our climate is able to scald severely the well-ripened Pear-wood; cold, or the absence of heat, is equally powerless to destroy it; while modern methods of culture render big wounds impossible by the number of little ones inflicted on the tree, and the rapidity with which the latter heal.

Surface or mound planting, root-pruning, double grafting, working the Pear on the Quince, the use of smaller trees, such as cordons, bushes, pyramids, and the more limited horizontal and fan-shaped trees, the augmentation of root-force, the abolition of severe hacking and hashing under the absurd pretence of pruning, more careful thinning of the fruit, thus fitting the burden to the back that carries it—have all assisted in the extinction of canker, and hence, instead of giving any of the smears or dressings that used to be given *ad libitum* as sure and certain cures, the better advice to all who have cankered Pear-trees is—root them out at once, and proceed to plant, treat, and train as here directed; and you shall have no more of it.

As to blight, and all the rest of the so-called diseases, they seldom do much injury in this country, but prove very destructive in America and other countries where the extremes of temperature are greater. But the means of treatment and methods of culture that will safeguard Pears against canker are exactly those that will also protect them from blight, sun-strokes, or frost-bites. Neither should Pears ever be planted in over-rich or over-wet soils, nor in the troughs of valleys, where spring frosts are almost sure not only to blacken all the fair prospect of Pears, but also to check the sap, and so produce a full crop of blight.

Insects.—The Pear-tree or Oyster Scale (*Aspideotus ostreæformis*) is by far the most troublesome and destructive of all the insects that attack the Pear. Small as it is, it not seldom attacks it with such force as to give the whole of the bark of the stems and branches a speckled appearance. It adheres so firmly to the bark that the old remedies, a hard scrubbing-brush or a blunt knife, were very inefficient. The new and better cure for most of these pests is oil, either animal, vegetable, or mineral. There is nothing better than the first, only the smell is disagreeable in the garden; the best colza or sweet oil will do instead, though hardly equally well. Two or three brushings over with paraffin will also kill the scale, but this lacks the emollient and soothing effect of the others on the bark and the branches of the tree.

Among maggots, weevils, and caterpillars that attack Pear-trees, several kinds are rather prevalent and destructive. The cold-water cure, that is, a stream of water from the garden engine, sent against the tree with full force, is one of the most powerful remedies against most of these pests. Lime and soot water, a peck of each to twelve gallons, well stirred up and left to settle, and only the clear water used; Gishurst compound, a pound to a gallon; tobacco, a quarter of a pound to a gallon; quassia beer of the same strength; dustings of dry, fine snuff; quicklime, soot, sulphur—are some of the deadly mixtures, or nauseous removers of most of these pests. Perhaps, next to the scale, the Pear-tree Chermes, *Psylla pyri*, as it is called, is the most troublesome. This injures and disfigures alike the tree and its fruit, both in its larva and perfect state. The effect is similar to honey-dew, as the insects puncture the bark, prey upon the juices of the tree, and produce sticky exudations. The moment they are seen, or even the slightest symptoms appear, they should be hunted for and destroyed, or washed off with strong soap-suds or weak sewage, tobacco, or clean water.

Pyralis luscana, or Red Bud Caterpillar, preys upon the leaves chiefly. The butterfly of this troublesome moth deposits its eggs in the heart of the current year's buds about midsummer. These are hatched early in the following spring, the caterpillar immediately setting to work to cut out the heart of the growing buds, and as it continues in the grub state for more than a month it makes great havoc among them. After this it spins a rather large white cocoon, and these, being conspicuous, are easily found and destroyed. The moths and cater-

pillars may also be caught and killed, and these and the general nauseators already named are the most efficient remedies.

Just as this insect feeds chiefly on the buds, so does the Slug or Slimy Worm, *Tenthredo cerasi*, confine its operations chiefly to the leaves. This small black caterpillar seldom begins operations till the autumn, when it consumes all the cellular tissues of the leaves, leaving the bare nerves and veins useless, skeleton-like leaves on the branch. Fortunately their work is easily seen, and a severe pinch between finger and thumb, or frequent dustings of quicklime, make an end of this small insect. If not taken in time, however, it ruins the leaves, and causes the fruit to drop or makes it flavourless. Only the day before writing this, the writer saw many Pear-trees totally wrecked for the season from the ravages of this small insect.

The *Tinea clerckela*, or Pear-tree Blister-moth, also operates on the leaves, and, unfortunately, commences operations in June, while the Tenthredo seldom begins its work of destruction till September. The Blister-moth also enters between the two skins of the leaves, and eats up and out all its internal tissues in safety, leaving the useless shells or outside covering intact. The leaves, as if shrinking from the touch of these insects, form protuberances or blisters, revealing their presence, and enabling the pomologist to squash them. The eggs of this insect are mostly found among the dead leaves under the trees, and all these should be burned, and every means used to destroy the moth and the caterpillar.

The larva of another insect, that of the Horned Tortrix, *Tortrix quercana*, also operates in a similar manner on the leaves, confining its operations to the under side, and concealing itself as far as may be by a thin web of its own manufacture. As it is careful never to pierce the leaf, and as its operations do not cause it to develop into blisters, it is more difficult to find. But in its last stage it becomes more bold, and spins itself into a white cocoon, and even rolls up the leaves to sleep in; and now comes the opportunity of the Pear-grower to make an end of this pest by hand-picking and burning.

Yet another caterpillar proves at times, though more seldom, most destructive to the leaves. This is called the Pear-tree Caterpillar, *Astyages hemerobiella*. Instead of consuming the whole leaf, this insect cuts it up into tiny patches, from a quarter to half an inch in diameter. This probably arises from its peculiar structure and mode of feeding—permitting it only to graze so far without a fresh start, on the same principle as a donkey on the line of its tether. This peculiarity reveals its whereabouts, and invites the destructive touch of the cultivator.

Most of the insects that prove disastrous to the Apple, with the great exception, however, of American Blight—that, fortunately, has not yet been induced to try Pears—may frequently be found on the Pear, and should be dealt with as described for Apples.

But the caterpillar of the Pear Moth, *Tortrix augustiorana*, like the Apple Grub, freely attacks the fruits, concealing itself under the eye and its appendages, by a fine web, while it gnaws into safer quarters under the rind, and feasts on the substance of the Pear-flesh. Fortunately most of such fruits fall to the ground prematurely, and if these and all prematurely withered leaves are picked up and burnt, the probabilities are that the majority of the insects will be destroyed with them.

All this may seem somewhat slow and tedious work, and it is, but it is astonishing how much may be done to clear off these most noxious insects by perseverance. These and other pests, such as wasps, flies, earwigs, beetles, ants, should be rooted out by cleanliness, filling up their lairs with mortar, making their homes uninhabitable with noxious smears, and alluring them into decoys and traps of various sorts, such as bottles half filled with sugar and beer, hand-lights so baited with ripe fruit that the wasps, &c., can easily get in, but cannot get out again. Besides this, all their nests must be destroyed, and birds and wasps netted out from choice fruits. Other enemies, such as rats, mice, squirrels, must be kept down if garden Pears or other fruit are to be plentiful or safe in the garden or on the walls.

BULBOUS PLANTS.

By William Goldring.

Calostemma.—At the present time this genus of Australian Amaryllidaceous plants is but little known in English gardens, though fifty years ago all those species comprised in the genus appear to have been grown. The plants are allied to the Eurycles, and the species somewhat resemble those of that genus. They are handsome plants, growing wild along the river-banks in New South Wales and Queensland, and sometimes in company with Eurycles. They are easily-managed plants if treated in the same manner as that recommended for Eucharis and Eurycles and similar genera inhabiting warm and moist localities. Being water-loving plants they should be allowed abundance of water during active growth, and even during the resting period they should not be allowed to become quite dry. The leaves are sometimes produced with the flower-stems, at others not until after the flowers are over. Late autumn is the usual flowering period in this country, consequently the plants are in active growth throughout the winter.

The three species are—*C. album*, which has broad leaves like *Eurycles Cunninghami*, and tall flower-stems carrying an umbelled cluster of white flowers, reminding one of the smaller-flowered Narcissi in point of form, as they have similar cup-like centres. It is a native of Northern Australia, therefore requires warmer treatment than the other two species. *C. purpureum*, the best-known species, is a handsome plant, having bulbs two inches in diameter; long linear leaves, usually developed after the flowers. The flower-stems, which rise about two feet high, bear umbels of flowers somewhat smaller than those of *C. album*. They are purplish-pink and sometimes white, and are sweetly-scented, the odour reminding one of peppermint. *C. luteum* is similar to *C. purpureum*, but has larger flowers, and yellow instead of purplish or white. The two latter species are natives of the more temperate parts of Australia, and therefore do not require the tropical treatment necessary for *C. album*.

Camassia (*Quamash*).—This is a genus of Lily-worts, natives of North America. The oldest and best-known species is one of the showiest hardy bulbous plants that we have in gardens. This is *C. esculenta*, or what is commonly called the Quamash, or Camass Root, by the North American Indians, who use the bulbs as food. When well-grown, this plant is a yard or more in height when in bloom. The spikes are quite erect, and are furnished upon their upper parts with from twenty to twenty-five flowers, measuring about two inches across and varying in colour from a slate-purple in the ordinary form, to an intensely deep violet-purple in the variety called *atro-cærulea*, which is by far the handsomest of the varieties. The foliage is long and grass-like, produced in tufts, as the bulbs invariably crowd together in old-established plants. The Quamash is indifferent as regards soil, though it loves a deep rich sandy loam, and thrives best in a sheltered yet sunny situation. Good bold clumps of it have a fine effect in a border having a background of shrubs. It begins to flower about the beginning of May, and lasts for a few weeks, and the flowers are suitable for cutting. The other species are *C. Leichtlinii* and *C. Fraserii*. The first may be best described as the counterpart of *C. esculenta*, except that the flowers are greenish-white. It is, moreover, altogether of a stronger constitution. It is not very common.

C. Fraserii is called the Eastern Quamash, as it is confined to the Eastern United States. It is a distinct and pretty plant, inasmuch as the flowers are of a kind of purplish-mauve, very soft and pleasing, but the whole plant is only about half the size of the common Quamash, and the spikes are shorter and smaller. Both of these species thrive well in company with *C. esculenta*. All may be raised from seed, which they produce plentifully in good seasons. It should be sown as soon as ripe, otherwise it is a long time in germinating. The easiest way, however, of increasing it is by division of the bulbs, that is, separating the small bulblets from the parent bulbs in autumn and re-planting them at once in prepared soil.

Chionodoxa Luciliæ (*Snow Glory*).—Since the introduction of this charming spring flower a few years ago from Syria, it has acquired a wide-spread popularity, till now it is as common as the Vernal Squills. It is indeed a lovely plant, and the garden that does not possess it is deprived of much beauty during the early days of spring.

It is a Scilla-like plant, with flower-stems bearing as many as a dozen blossoms, which are from one inch to one and a half across, of a bright turquoise-blue, with pure white centre. In mild seasons the first flowers expand in the beginning of February, and it continues in beauty for some weeks. It has proved itself perfectly hardy, and an easy plant to cultivate; indeed, it is difficult to eradicate it where once established, as it multiplies so freely, and disperses its seeds widely, so that self-sown seedlings spring up in all directions near the original plants.

It is a plant that requires to be left alone undisturbed for some years, otherwise, if lifted often the flower-stems are weakly and the flowers small. Any ordinary garden soil suits it, but it is grateful for a deep loamy soil and a warm sunny situation.

It is largely imported from the mountains of Syria, and as it grows in company with *Scilla bifolia*, the two plants are imported together, and it is difficult to separate them until in flower, as the bulbs are so much alike. This species, which is also called *C. Forbesi*, is by far the most showy of the cultivated species, though *C. sardensis* is extremely pretty, chiefly differing from *C. Luciliæ* by its smaller flowers and the absence of any whiteness in the blooms, being wholly of the richest blue. Another and rarer species, though long cultivated under the name of *Puschkinia scilloides*, is one called *C. nana*. It is only about half the size of *C. Luciliæ*, and the flowers though small are of a pretty porcelain-blue, produced in short loose spikes. It is more delicate than the other species, and requires a select spot out of harm's way of ranker-growing plants. Also a native of Asia Minor.

Chlidanthus fragrans.—This is a handsome native of Chili and Buenos Ayres, having large trumpet-shaped blossoms of a bright yellow, and very fragrant. It is a rather tender plant, and either requires green-house or frame culture, or in southerly

districts to be planted in a warm border at the foot of a south wall. The bulbs should be potted or planted in early spring, in rich loamy soil. In the case of pot culture the bulbs should not be watered until the foliage appears, but when in active growth water may be given liberally, and the plants may be placed on a light shelf in a green-house or frame. Its flowers appear about June, and after the foliage has ripened and decayed the bulbs may be taken out of the soil, and kept in dry mould or sand till planting-time in spring—February or March.

Chlorogalum pomeridianum (*Soap Plant*).—This Californian plant cannot be called showy, but as it is distinct in appearance, some may like to grow it. It has a large bulb, long narrow leaves, and produces a spreading branching flower-stem, bearing numerous white flowers in summer. It is hardy, and thrives in an ordinary border, and is not worth much attention. It is nearly allied to *Camassia*, and the white *C. Leichtlinii*; is also called *Chlorogalum Leichtlinii*.

Choretis glauca.—This is an old, and at one time was a common, plant in hot-houses. It is a near ally of Pancratium and Hymenocallis, in which latter genus it is included by botanists. Its large black-coated bulb bears several broad and long leaves of a glaucous-green tint, hence its name. The flowers are produced in terminal umbel-like clusters. Each has a long slender tube, narrow sepals, and a large cup-like crown of transparent whiteness, spotted in the middle with green. It has no particular flowering season, but blooms generally from early summer till autumn. It requires the same treatment as such evergreen bulbs as Hymenocallis and Pancratium, directions for which will be given hereafter.

Coburghia.—Though not generally cultivated in this country, a few of the Coburghias, which are all South American bulbs, are really very handsome, and well deserve the attention of cultivators. A good many species are known to botanists, but only a few have been introduced. The best known is *C. incarnata*, which has long been a favourite green-house plant. It has large bulbs, which send up stout flower-stems terminated by clusters of four or five very beautiful coral-tinted and scarlet flowers, which are tubular and gracefully droop. Another handsome species is *C. trichroma*, the flowers of which are similar to the foregoing but coloured with green, yellow, and salmon tints. *C. fulva*, a less showy kind, is also cultivated. The Coburghias, being deciduous, may be kept in dry sand or mould during winter, and potted in early spring in rich loamy soil, as they are gross feeders when in active growth. A warm and moist atmosphere is best for the bulbs when first started, but after the leaves are fully developed a drier treatment must be given, together with as much sunlight as possible, in order to thoroughly ripen the bulbs. They flower at the end of summer, after which the bulbs have done their work for the season, and may then be rested until spring by withholding water.

Colchicum (*Meadow Saffron*).—In the shortening days of autumn, when the brightness of the summer flowers is on the wane, the Meadow Saffron flowers peep above the ground, and are therefore most welcome at that season, although they lack the interest that spring-flowering bulbs awaken. The Meadow Saffrons are indeed very old-fashioned plants, for they have been cultivated from the earliest times, they were familiar to such early writers on garden plants as Parkinson, who admirably figures some of them in his quaint book, and from that time to this they have always been favourites in English gardens.

The Colchicums when in flower so much resemble the Crocuses that to many they are indistinguishable, though they are abundantly distinct in foliage, which in the Colchicum is long and generally broad, while in all the Crocuses it is grass-like. With but few exceptions the flowers appear unaccompanied by leaves, these having died away during the previous summer, not to reappear before the early spring, when they are accompanied by the seed-pod, which during winter has been maturing itself beneath the surface. The bulbs of the Colchicum are, moreover, very different from those of the Crocus, being more like those of Tulips. The prevalent colour of Colchicum flowers is rose-purple, the exception being in *C. luteum*, a Himalayan species with small yellow flowers, and which is scarcely worth cultivation.

There are a good many species of Colchicum in gardens, but several of them bear such a close resemblance to each other when in flower that they are well regarded by the gardener as identical.

C. autumnale, often called the Autumn Crocus, is by far the commonest of the Meadow Saffrons, and on account of its having been cultivated in some parts of the country for the manufacture of a drug from its roots, it has become so plentiful that it is looked upon as a native plant. It flowers about September, unaccompanied by leaves, but being produced in clusters of several together, the flowers are showy. In the typical kind they are pale mauve-purple, but there are several varieties, particularly with double flowers, that vary in tint. Thus, there is a double white, *album plenum*; *roseum*, of a more rosy hue than the original; *pallidum*, very pale pink;

striatum, striped mauve and white; and *atropurpureum*, several shades darker than the type. The double sorts, especially the double white, are the most desirable as they are most attractive in a border and endure longer in flower. Nearly allied to *C. autumnale*, as regards the size and form of the flowers, and flowering at the same period, are *C. byzantinum*, *turcicum*, *lætum;* and similar species, but having smaller flowers, are such as *arenarium*, *neapolitanum*, *alpinum*, and *umbrosum*. With rather small flowers, and flowering either in the autumn or spring, are *C. montanum* and *C. crociflorum*. The foregoing species, being so nearly alike from a garden point of view, might well be included under the head of *autumnale*, and being all hardy they thrive under the same conditions, such as an ordinary border. Some, such as *C. byzantinum*, have very broad leaves, while those of others are small and narrow; but as these are always produced in spring, and not at the flowering-time, the foliage is of little interest.

C. speciosum is by a long way the finest of the Meadow Saffrons, and is at the same time one of the finest of all autumn-flowering hardy plants. It is like a magnified *C. autumnale*. When well-grown the large globose flowers are nearly a foot high, and of a rose-purple, varying in intensity in the various forms. This is, indeed, a noble plant, desirable for every garden; and as it flowers in September and October, when open-air flowers are not plentiful, it is doubly welcome. Like *autumnale*, it flowers without leaves, these being produced in early spring, and when full-grown they are some four inches broad, and about a foot in length; they are, therefore, handsome in the spring border.

C. variegatum.—This species may be taken as the type of about a dozen others, characterised by the tessellated or chequered markings of the flowers, otherwise they resemble the *autumnale* set, as they are about the same size and form, and flower at the same period, and also before the foliage. The principal species in the group is *C. variegatum* itself, one of the oldest of garden plants, having been cultivated in the sixteenth century by Parkinson. It still retains the name of *C. Parkinsoni* as well as that of *C. chionense*. The flowers have pointed sepals, of a pale lilac, chequered with deep lilac-purple. *C. agrippinum*, also called *tessellatum*, is similar, as are *C. Bivonæ lusitanum*, and *Tenorii*, all of which are in cultivation. All are natives of South Europe and Asia Minor.

Culture.—Colchicums are the simplest of bulbs to cultivate; indeed, they require no attention whatever when once they are planted in suitable soil, and in a congenial spot. Any garden soil suits them, though they have a decided partiality for a sandy loamy soil. They rarely, if ever, require transplanting, and therefore the bulbs need not be disturbed, except for the purpose of propagation, once in about three or four years. When it is necessary to lift the bulbs it should be done about midsummer, and they should be re-planted at once in fresh enriched ground. When undisturbed a little mulching of leaf-mould or manure in winter will benefit the bulbs. Seedlings of Colchicums can easily be raised, as seed is borne and ripened plentifully. It should be sown as soon as ripe, which is about midsummer, and the seedlings will attain a flowering size in about three seasons. As the bulbs of nearly all the Colchicums flower in a dry state, even if not in soil, they may be flowered in rooms like Hyacinths. The bulbs should be placed in damp sand, and surrounded by Fern-fronds or other greenery; they then have a pretty effect. As soon as the flowers are past the bulbs should be planted out.

Colchicums are so accommodating that they may be grown in various positions in the mixed border, shrubbery margin, rock garden, or may be naturalised in grass in semi-wild spots. In the latter position care must be taken that the foliage is not cut off before it is quite ripened, or the bulbs will be weakened. The bulbs produce the best effects when planted in bold masses, not dotted here and there in small patches.

Cooperia.—There are two plants belonging to this genus, both natives of Mexico and Texas. They are allied to the Zephyr Flowers (*Zephranthus*). These are *C. Drummondii* and *C. pedunculata*. The first has grassy foliage about a foot long, produced in autumn. The flower-stem, about four inches in height, bears a bloom having a slender tube four and a half inches long, and white petals, the whole flower being some two inches across. Each bulb produces two or more flower-stems in a season, but the flowers do not endure more than a day or so, and they generally open during the evening. *C. pedunculata* is a finer plant, having longer leaves and larger flowers, the latter being over two inches across, pure white, and very fragrant. The Cooperias are not very hardy in this country, and require frame or green-house culture, in pots. Their resting period is during summer, when devoid of foliage; they should then receive all the sun-warmth possible, in order to ripen their bulbs and prepare them for sending up their leaves and flowers in autumn.

Crinum.—For the stove, the green-house, and even the open-air border, the Crinums are of great importance, being among the finest of all bulbs of the Amaryllis family. They are for the most part

stately in growth, bearing handsome evergreen foliage, and generally large, beautifully coloured, and often very fragrant flowers. But notwithstanding these good qualities they are not a popular class of plant, and until lately have suffered from undue neglect in gardens. Since, however, some handsome new species have been introduced a fresh impetus has been given to their culture, and they will in all probability become popular.

The genus is a large one, and is widely distributed throughout the world, but chiefly in the tropics. The species require, therefore, diverse cultural treatment, some succeeding in the stove, others in the green-house, while a few may be grown in the open air in this country.

The characteristic features of Crinums are tunicated bulbs, sometimes globose, but often elongated into a sort of thickened stem, or neck; the leaves are usually long, broad, fleshy, channelled, and evergreen. The flower stems are generally stout and erect, longer than the leaves, and terminated by umbelled clusters of flowers; these are usually large and shallow-cup-shaped.

CRINUM BRACHYNEMA.

The genus, which numbers over sixty species, is divided into three sections or sub-genera, the distinguishing characters of which are based upon the form of the flower, and each of these groups includes about an equal number of species. First, there is the *Asiaticum* group, in which the flowers are usually quite erect, and with narrow petals. Included in this group, with *C. asiaticum* as the type, are *C. defixum*, *pedunculatum*, *bracteatum*, *cruentum*, and *caribbæum*. The second, or *Americanum* group, is characterised by the tube of the flower being straight or curved, and the petals spreading out flat when fully expanded. In this group are *C. americanum*, *amœnum*, *augustum*, *angustifolium*, *purpurascens*, *erubescens*, and *pratense*. The third group, of which *C. latifolium* is the type, includes all those species which have flowers with curved tubes and broad horizontally poised petals. This section includes the handsomest species, such as *C. latifolium*, *Careyanum*, *Broussonetii*, *giganteum*, *lineare*, *campanulatum*, *capense*, *flaccidum*, and *zeylanicum*.

C. amabile. — This is one of the largest-growing species, having smallish bulbs, and producing from twenty to thirty evergreen leaves, about a yard in length. It flowers in winter, producing on a stout stem, two or three feet high, some twenty or thirty flowers in a dense umbelled cluster. They are white, tinged on the outside with red. They are deliciously fragrant, which renders it a desirable plant for the stove. It is a native of Sumatra, therefore requires the warmest treatment.

C. americanum.—Being a native of the Southern United States, this species is almost hardy in this country. It has a large ovoid bulb, with a short neck, and narrow leaves from two to three feet long. The flower-stem, produced in summer and about two feet high, bears an umbel of about half a dozen very fragrant pure white flowers. This beautiful plant is worth special attention, more particularly as it may be grown out of doors. It likes a deep light soil in a warm sunny spot, with plenty of moisture during summer. It is advisable to plant the bulbs deep and protect them during winter with ashes or litter.

C. angustifolium — an Australian species — is a medium-size plant, having a globose bulb and narrow leaves, from one and a half to two feet long. The flower-stem is about a foot high, bearing an umbel of about five or six white flowers, with red stamens. Requires stove treatment.

C. asiaticum is one of the commonest and best-known species in gardens. It is one of the largest-growing species, having bulbs about six inches high, with a long thin neck. The leaves, some three or four feet long, are broad, and deeply channelled. The flower-stem carries as many as two dozen blossoms, some three or four inches long, and white tinged with red. Though a plant of noble growth, it is not so desirable as *C. augustum*, and like that species is only suited for very large stoves. It is a native of tropical Asia, where it has a wide distribution, and this gives rise to several varieties more or less distinct.

C. augustum is a large-growing plant of noble appearance, having a bulb quite a foot in height, and half as much in diameter at the largest part. The leaves are about a yard long, and from twenty to thirty to each bulb. The flower-stems are from two to three feet high, stout and erect, bearing in a dense umbel from one dozen to two dozen flowers, from three to four inches long ; bright red on the outside, palish within. This noble species, one of the finest of the genus, is a native of the Mauritius, where it grows in marshy places. It requires a stove temperature and abundance of moisture. It is only suitable for growing in the largest hot-houses, and it is frequently met growing in huge tubs and pots.

C. braehynema.—A pretty and distinct species, small enough to be grown in any hot-house. It has ovoid bulbs about three inches in diameter, and with a distinct neck. The leaves are about two feet long, and the flower-stem, about a foot high, bears a cluster of pure white flowers, about two inches across. It is a native of the Bombay Presidency, therefore requires a warm and moist treatment.

C. braeteatum is a tropical African species of medium growth, bearing clusters of from ten to twenty white flowers, that are somewhat fragrant. Not so desirable as some other species.

C. campanulatum. — A beautiful Cape Colony species, rare in gardens, but extremely desirable on account of its being a cool-house plant. Its ovoid bulb produces several long narrow leaves and slender stems, terminated by about half a dozen bright red-purple flowers, some three inches across. It grows naturally in wet places, and on that account received the name *C. aquatieum.* It may be grown successfully in a green-house, or even in a frame, and must be treated as a sub-aquatic, abundance of moisture being requisite for it, particularly during its growing season.

C. capense is another South African species, and is one of the commonest in gardens, where it may be found under the various names of *Amaryllis capensis*, *A. longifolia*, and *C. riparium.* It is quite hardy in this country, even so far north as Edinburgh, and not only thrives but produces seeds abundantly, from which seedlings may be easily raised. It has a bulb three or four inches long, and as much in diameter, producing about a dozen pale green leaves, some two or three feet long. The flowers, produced in clusters of from six to twelve, on stems about one and a half feet high, are large, and showy, varying from white in the variety *album*, to deep purplish-red in the variety *riparium.* Being such a free seeder, hybridists long ago succeeded in raising numerous distinct and beautiful hybrids. In Dean Herbert's time several were raised between this species and such as *C. scabrum*, *lineare*, *Careyanum*, *latifolium*, and others. The names of these hybrids were *C. Govenii*, *Herbertii*, *Walliehii*, *Seymourii*, *Shepherdii*, and *Mitchamiæ.* It is doubtful if any of these older hybrids exist in gardens at the present day, but there are some newer crosses which are probably quite as handsome, and one called *Powellii*, presumably a cross between *C. capense* and the beautiful *C. Moorei*, a nearly hardy species, is a very fine variety, and one that must eventually prove of great value as a garden plant. It has umbels of large open flowers, of a beautiful deep rose-pink colour. It is quite as hardy as *C. capense*, and thrives in the neighbourhood of London in an open moist border. *C. capense*, like *campanulatum*, is a semi-aquatic plant, and if not grown actually in water or mud, must be supplied with abundance of water during summer.

C. Careyanum.—One of the handsomest of all the Crinums, and an excellent garden plant, being easily managed. It has a globose bulb, some three or four inches in diameter, and a short neck. The leaves, half a dozen to a dozen on each bulb, are long, of a deep green, and wavy. The flower-stem rises about one and a half feet high, carrying a cluster of lovely ivory-white flowers, tinged with pink, and some four or five inches across. It is an old and well-known plant, but none the less beautiful for that. The name *Careyanum* is often found in gardens and nurseries attached to other species, particularly those which, like it, have a curved flower-tube and spreading sepals. Being a native of Mauritius it requires stove treatment.

C. Commelynii—a native of tropical America—is a very old species, figured so long ago as the beginning of the last century. It has a medium-sized short-necked bulb, long and narrow leaves, and largish flowers, with the sepals marked with red-purple on their exteriors. It is an interesting plant, but not one of the most desirable. Stove.

C. erubescens in stature and leaf is similar to the preceding, and also has short-necked bulbs. The flowers are produced from four to eight together in umbels, on stems from one and a half feet to two feet high. They are white, tinged with claret-purple, the sepals being narrow and reflexed. An old and well-known plant in gardens. A native of South America. Stove.

C. Forbesianum.—This handsome species has long been introduced to gardens, though it is still uncommon. It belongs to the *latifolium* section. It has a very large bulb without a neck, and about a dozen very long and glaucous leaves. The flowers are produced thirty or forty together, in an umbel, on a short stout stem. They are large, with sepals about an inch broad, white, conspicuously banded with bright red down the back. It is a native of Delagoa Bay, and therefore requires warm stove treatment.

C. giganteum is a favourite species in gardens, on account of its flowers being large, of pure ivory-whiteness, and deliciously fragrant. The bulbs are long-necked, and as much as six inches in diameter. The leaves are nearly a yard long, and bright green. The flower-stems rise about two or three feet high, bearing from four to six flowers, produced generally in April, but it often continues to send up flower-spikes throughout the summer. It requires stove treatment, and abundance of moisture while growing. It is a native of West Tropical Africa, growing in deep swamps in the forests. A finer garden plant could not be desired.

C. Kirkii, a recently introduced species from Zanzibar, is an excellent garden plant, distinct and highly attractive in flower. It has medium-sized bulbs, long and bright green leaves. The flower-stems generally thrown from each bulb are about one and a half feet high, each carrying about a dozen large flowers, having white sepals, conspicuously striped with deep red. It is justly considered to be one of the finest of the cultivated Crinums. It succeeds well under ordinary stove culture.

C. latifolium.—A variable species, widely distributed throughout the plains of India. It is a handsome plant, with globose neckless bulbs, numerous long bright green leaves, and flower-stems rising about two feet high, bearing umbels of from ten to twenty flowers. These are large, with sepals an inch broad, white faintly tinged with red. Stove.

C. Moorei.—The introduction of this lovely species from South Africa some years ago was a great gain on account of its being nearly, if not quite, hardy in these islands. It has certainly proved hardy at Glasnevin, near Dublin, where it was received first. There it has been planted out for years at the foot of a warm wall, and though in severe winters the foliage becomes injured, the bulbs pass unscathed, and throw up young foliage again in spring. It has very large globose bulbs, with an unusually long neck, and bright green leaves, from two to three feet long. The flowers are about six inches across, openly bell-shaped, and of a lovely soft pink colour. They are produced from six to ten together in umbels, on stems from one and a half to two feet long. This is such a beautiful plant that it deserves some attention in growing it well, and though so hardy it should not be risked outside, except in very favourable localities. It grows admirably in an ordinary greenhouse, only requiring plenty of water while growing, and a slight rest in winter. It is so floriferous that it frequently sends up flower-stems throughout the summer in succession, therefore its value as a greenhouse plant cannot be over-estimated. There are a few distinct forms of it, varying in tint from almost a white to a deep rose. It may be found in gardens under the names of *C. Macowani*, *Mackenii*, *Makoyanum*, and *ornatum*, but most of these names apply to distinct species.

C. pedunculatum is a small-bulbed species in the way of *C. amabile*. It has huge umbels of fragrant flowers, with narrow, reflexing sepals, and pure white. The bulbs are large, thick-necked, and the leaves long and broad. It flowers in summer. It is a native of New South Wales, and a variety of it, called *pacificum*, is a native of Lord Howe's Island, where it is known as the Wedding Lily. It succeeds in a warm green-house, rarely failing to produce several spikes of bloom during the summer. It is found sometimes catalogued as *C. australe*, its older name.

C. Sanderianum, a newly introduced species from Sierra Leone, is of medium growth, with bulbs some two inches in diameter. The flowers are large, with white sepals, broadly banded with reddish-crimson. Not much is known of its culture, but it presumably requires warm and moist stove treatment.

C. scabrum, a native of Rio Janeiro, is a very handsome warm green-house species. It is one of the largest in growth, having massive bulbs, and very long and broad leaves. The flower-stems, however, are shortish, and few-flowered, producing only about half a dozen blooms in each umbel. These are white, striped with red. It is a free-flowering species, each plant bearing several flower-stems during the summer.

C. zeylanicum is a beautiful species, and valuable on account of its winter-flowering tendency. It has large globose bulbs, without a neck, long and tolerably broad leaves. The flower-stems, about a yard high, bear large umbels of deliciously fragrant blossoms. These are white, with a broad band of claret-red down the centre of each of the narrow reflexed sepals. It is widely distributed through

tropical Asia and Africa, and has long been in cultivation. It requires stove treatment.

Culture.—The tropical Crinums are among the most easily cultivated bulbs, and any one who can grow Eucharis, Pancratiums, and all such-like bulbs well, can succeed with Crinums. The chief point to observe is that, in order for Crinums, or indeed any other bulbous plant, to flower freely, the bulbs must be well developed, and thoroughly ripened. Hence it is a matter of importance to treat the plants liberally while they are developing bulbs, by allowing plenty of heat and moisture, and nutritious food in the way of diluted manure-water occasionally. As the various species of Crinum are so diverse as regards their habit of growth, flowering season, and other peculiarities, no definite rule can be laid down as to when the plants will require this liberal treatment. This must be applied when they are in active growth, and this active growth generally commences after the bulbs have bloomed. When new leaves are being made, and offsets developed, then is the time to give the plant nourishment. After the growth is perfected water may be gradually withheld, and, if convenient, the plants at the same time should be placed in a lower temperature. This resting period, in the case of most of the species, generally occurs during winter, and with the warm days of spring active growth commences. In the case of the evergreen kinds, they must not, of course, be kept dry at any period, and they may be purchased at all seasons at nurseries. The deciduous species must be kept dry while leafless, and these may be purchased in a dry state during autumn and winter. Being mostly natives of wet places, Crinums require, as a rule, more water than the generality of bulbs; in fact, during summer they cannot well have too much. It is well to remember also that, like many other bulbs, they do not like to be disturbed; indeed, they thrive best when pot-bound for years, so long as they receive nourishment in the shape of manure-water occasionally. The best time to re-pot is directly after they have flowered, potting them firmly in good-sized pots, allowing ample room for soil, which should consist of good fibry loam, with enough sand to keep the compost open. For the strong-growing kinds a little well-decayed manure, leaf-mould, or crushed bones, may be mixed with the potting compost. In potting Crinums the bulbs must not be inserted in the soil deeply, as it is natural for the collar or neck to be above ground. In the case of those species indicated above that are hardy enough to be planted out in frames or out of doors, such as *C. Moorei*, *americanum*, *capense*, the good soil must have a depth of about two feet, as the bulbs must be planted deep, and they throw out long fleshy roots, which require nourishment. These half-hardy kinds always succeed best at the foot of a warm south wall, and the secret of success is to leave them undisturbed from year to year, protecting the bulbs during the winter by a heap of ashes or leaf-mould.

Propagation.—The simplest method of increasing Crinums is by detaching the bulblets which form around the parent bulbs during the season. These should be detached at the potting-time, and should be potted in small pots, placing a layer of sand beneath the bulb so as to induce the formation of rootlets. Afterwards, the bulbs will require the same treatment as adult plants. Some species throw out bulb-bearing runners much more freely than others. Crinums may also be propagated readily by seeds, which they freely produce, as a rule. By intercrossing the various species some very fine hybrids have been raised. The seeds, which are round and fleshy, are generally a long time coming to perfection. They should be sown, as soon as ripe, on the surface of shallow pans filled with ordinary potting soil, and kept warm, moist, and close. In a few weeks the seeds will germinate, and as soon as they are large enough they should be potted separately in small-sized pots. Their after-treatment, until they arrive at a flowering age, is much the same as that recommended for other stove bulbs, but as the aim is to develop the bulbs into a flowering size, they should not receive the alternative treatment of starving and feeding which is necessary in order for mature bulbs to flower freely.

THE PEACH AND NECTARINE UNDER GLASS.

By William Coleman.

PRUNING.

OPINIONS differ widely as to the best mode of pruning the Peach and Nectarine. Some cut their newly-planted trees back to within a few buds of the base by way of giving them what they term a fair start. Others shorten moderately, some not at all. The first belong to the old school, the last to a school that is older than some writers, who claim the system for themselves, would have us believe. The middle course is taken by men who are ever ready to take advantage of the two systems in order to shape their trees to their ends. When Peach-trees are established on open walls, shortening back to well-ripened buds is often necessary; but where the cultivator has the advantage of all the elements, including fire-heat as now applied to modern glass-houses, the strongest shoots should be ripened up to the extreme points, and regularly furnished with wood and blossom buds.

Extension Training.—Assuming that the trees with which a set of Peach-houses was planted in the autumn are the best the nurseryman could supply, that they contain ten or twelve shoots each as in Fig. 8, and the extension fan system of training, which is the best, has been decided upon; if all the shoots are equally strong, four on each side may be laid in the full length, the first or lowest pair nearly horizontal, the others radiating from the centre; but if any are unusually strong, they must be shortened back to a good bud, to preserve the even balance of the tree. When we come to the two shoots nearest the centre, and therefore nearly vertical, shortening back to one-half their length, say at *a a* (Fig. 8), will induce all the back buds to break, from which a sufficient number of shoots can be selected to form the centre of the future tree. When this moderate pruning has been completed and the shoots have been neatly tied to the wires, daily syringing will soon cause every bud to throw out a shoot; but as not more than one-tenth of them will be required, disbudding, when they get about two inches in length, must be gradually proceeded with. The back and fore-right shoots should be taken away with a sharp knife. Then after an interval of a day or two all the breaks on the lower sides should be reduced to three, and when it is seen which of the growths on the upper sides are well placed and likely to take the lead, two of the best should be retained, one near the base, and another nearly midway, all the others being taken away. As growth under glass will be rapid, these in a few days will again require thinning by the removal or pinching of the growths from the lower sides, the lateral growths on the upper sides with the leader being sufficient to form the first year's shoots. These must be regularly tied in from four to six inches apart, and allowed to grow to the fullest extent, at least so long as there is no sign of any of them being left behind. Should this be the case, the points of the most vigorous leaders must be pinched where it is deemed necessary to maintain the proper balance of every part of the tree. If this is not done the leaders near the centre are apt to get too strong at the expense of the side shoots, which are less likely to receive a fair share of the sap when it has forced its way into these vertical channels; but by pinching the extreme points of these leaders, laterals and sub-laterals can be obtained and laid in so as to form a very large tree by the end of the season.

Fig. 11.—Extension Training.

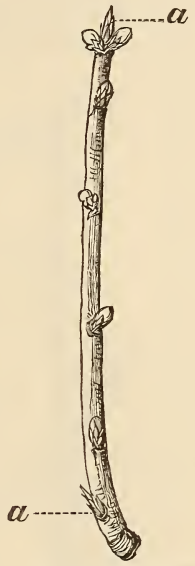


Fig. 12.—Wood-buds at *a a*.

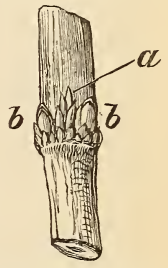


Fig. 13.—Wood-buds and Flower-buds.

When the wood is ripe it will be found that an evenly-balanced tree, from eight to ten feet across the breast, capable of bearing several dozens of fruit, is again ready for the winter pruning, if the entire removal of a superfluous shoot can be called pruning. No shortening back will be needed, but each terminal bud must be again allowed to break and push its way to the extremity of the space which it is allotted to fill; disbudding must also be attended to, and great care must be observed in performing this with a liberal hand, as over-crowding is one of the worst evils the extension trainer has to guard against. When the trees have filled the trellis, the annual removal of the shoots from which the fruit has been gathered is extremely simple, as each of these will have a young growth that originated near the base (as in Fig. 11) ready to take its place. The best time to do this is immediately after the last fruit

has been taken from the tree, for then the foliage, which grows to a large size under extension training, gets the full benefit of light and air, and the force of the returning sap goes to the perfect formation and maturation of the buds from which the succeeding year's crop is to be obtained.

When all the leaves have fallen from the trees, and the time has arrived for giving them the winter dressing, it will be necessary to go carefully over every branch with a sharp Peach-pruner to smooth any cuts that were imperfectly made while the foliage was yet upon them, and to shorten a leader where it has reached the extremity of the trellis. In order to perform this properly, it is necessary to be able to distinguish wood-buds from blossom-buds, for if shortened back to the latter, the shoot will die back to the wood-bud next below it. Sometimes all the buds on a shoot, with the exception of the terminal and one at the base, are flower-buds (Fig. 12), the removal of which would cause the shoot to die back altogether; therefore, to avoid this mishap, the operator should be able to tell at a glance which is the proper bud to prune back to. Fig. 13 represents a portion of a shoot with a triple eye; *a* in the centre is a wood-bud; *b b* are flower-buds. In Fig. 14, *a a* are wood-buds, *b b* are flower-buds. The first are long, narrow, and pointed; the latter globose, plump, and hoary. It is always safe to prune to a triple bud, not so to a single bud, although it may be long and pointed, as some varieties of Peaches, especially Noblesse, cast all their wood-buds, if at all weak, except the terminal and one near the base. Some kinds of Peaches have a tendency to produce spurs, as in Fig. 15. All the buds on this growth but two, *a a*, are blossom-buds, consisting of the rudiments of the future flower. Those near the point, being ripe, generally set freely, and sometimes produce good but not such fine fruit as that obtained from the free-growing shoots. When shy kinds, like Belle Beauce, are forced early,

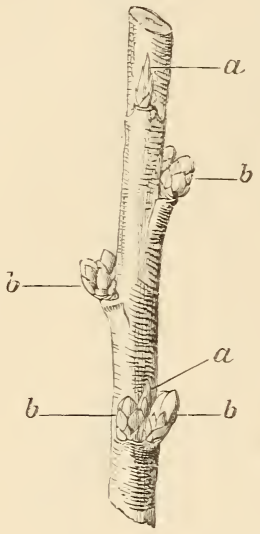


Fig. 14.—Wood-buds and Flower-buds.

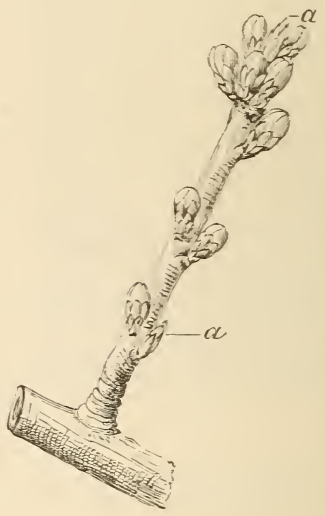


Fig. 15.—Dormant Spur of Royal George Peach.

many growers pinch some of the fore-right shoots instead of rubbing them off to induce the formation of spurs, and believers in the short-lived Cordons depend greatly on spurs for their supply of Peaches. But under extension training they are not often met with, neither are they needed.

In a preceding chapter, short or tall double-worked standards were favourably noticed. Why these trees do better than dwarfs it is difficult to explain, unless it is that the second working is further away from the ground, and the sap in its upward course gets two slight checks instead of one. Such, however, is the case under glass as well as in the open air, and it is to be regretted that nurserymen do not work more of their trees on two to three feet stems. The house shown in Fig. 3, and a case containing 350 square feet of trellis, were planted with trees of this kind, and the produce within four years paid for the houses. The measurement of one of the stems, a Royal George, now rising five years from an untrained maiden, is fourteen inches close to the ground, and sixteen inches just below the upper working. It produced twenty dozen of fruit in 1883, eighteen dozen in 1882, and the first crop in 1881 was borne on strong shoots, many of them five feet in length. The Peaches on these growths were left twelve inches apart. Many of the old-school disciples predicted a finely-swelled Peach at the top of each shoot, others a failure: but all came up alike well. The tree at the present moment is a sheet of flower from base to summit, and will most likely yield twenty-five dozen of fruit of the finest quality. The pruning of this particular tree, which is a fair but not an extraordinary example of the extension principle, is managed in the following way. Young growths of the preceding summer are laid in regularly at the winter dressing six inches apart; but none of them are shortened back unless there is likely to be a dearth of fruiting wood in any parti-

cular part of the tree the following year, when they are pruned to a triple bud. The summer management is equally simple. When ready for disbudding a promising break is left near to the base, to be tied in parallel with the fruit-bearing wood which it is intended to replace after the Peaches are gathered. All surplus breaks, with the exception of those from the nodes where the fruit is intended to remain, are then removed: but the latter are pinched in close to secure foliage unless the tree is likely to become crowded, in which case they also are gradually removed. The leading shoots grow on until the fruit commences the last swelling for ripening; the points are then pinched out, unless they are main leaders, to throw size into the fruit. When trees of this kind are properly formed, a person of only moderate experience can manage them, as it is simply necessary to secure a good break from the bottom of every fruiting shoot, and perhaps one also from the centre of extra strong growths.

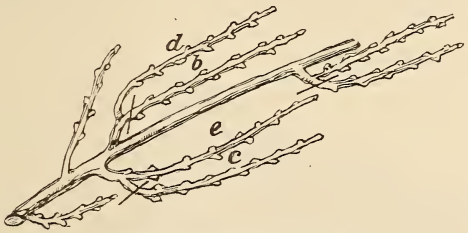


Fig. 16.—Restrictive Pruning.

Restriction Training.—Although extension training has resulted in the production of many of the finest old trees in the kingdom, and many gardeners have found it equally applicable to all other kinds of fruit-trees, there are others who still remain faithful to the system so ably, and it may not be too much to say, unfortunately, propounded and illustrated by Dr. Lindley and Robert Thompson. As if the annual cutting back in the nursery were not enough, all growers of stone-fruit trees were taught to continue the use of the knife not only to give the thrice-cut-backs "a fair start," but to continue the process by cutting away one-half, and in some cases two-thirds, of every shoot at the winter pruning, rendering the formation of a tree, say twenty feet by twelve, the work of half a lifetime. But why a tree should be paralysed by having at least one-half of its annual growth cut away at the winter pruning is a mystery to many, the more so as trees well furnished with ripe wood are capable of fulfilling all the conditions that the most fastidious can desire. As the restrictive or repressive mode of pruning simply means shortening every young shoot back to a wood-bud, the diagram, Fig. 16, will convey all that it is needful to say for or against the system. It must not, however, be inferred by the uninitiated that the quality or size of the fruit is deteriorated, as this is not the case. It is the useless loss of time in covering the allotted space, and as a consequence the unnecessary sacrifice of a quantity of Peaches, that is at fault.

In Fig. 16, "*b* and *c* represent fruit-bearing shoots, which, unless they are leaders, would be cut away after the Peaches are gathered to make room for the successions *d* and *e*;" but why the latter should be shortened back to one-third their length, more or less, according to the position of a wood or triple bud, modern pruners are at a loss to understand.

In Fig. 17, the branch *d* has produced two moderately strong shoots, each of them capable of bearing fruit. The extension pruner would leave them intact: the restriction pruner will shorten one back to a wood-bud at *a*, and cut the other away at *c*, leaving three clusters of flower-buds to bear fruit, and two wood-buds, that at *b* to produce a shoot for extension.

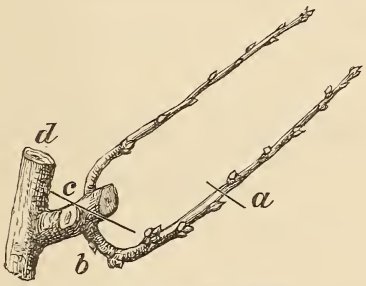


Fig. 17.—The Two Systems.

Seymour's System.—Then, again, there is Seymour's system, which, like the many forms in favour with the French, leads by a most complicated mode of cutting and training to the formation of handsome geometrical trees, more remarkable for their appearance than their fruit. Seymour's system necessitates having a vertical leader from which all the side shoots start with mathematical precision, as in Fig. 18. Every bud is rubbed off the lower sides of these shoots, and the bearing wood is laid in from the upper sides. All goes well until accident or gumming causes one or more of the main shoots, or it may be a portion of the leader, to die off, and the tree is no longer pleasing to look upon. Should any reader wish to adopt this tedious system, he must commence with a maiden tree, cut it down to three eyes, train up a leader and one side shoot each way. The following year the leader must be again shortened to three eyes, when a second pair of side shoots will be trained nine inches above the first pair, and so on until the wall or trellis is covered, if such a remote event is ever accomplished. When the first pair of

side shoots is ready for disbudding, all on the lower sides are rubbed off, and the others are thinned out; those left are nailed or tied in during the summer, but the following season they are tied down to the main branches, where they are supposed to bear fruit, when they are cut out to make room for young growths which originated in wood-buds at the base of each. When the fruit begins to swell, the terminal as well as the lateral breaks are kept pinched so as to give the young wood and foliage light and warmth. Indeed, the system of managing the fruiting and succession wood is very similar to that recommended for Cordons, only all the young growths are here on the upper sides of the oblique shoots or branches.

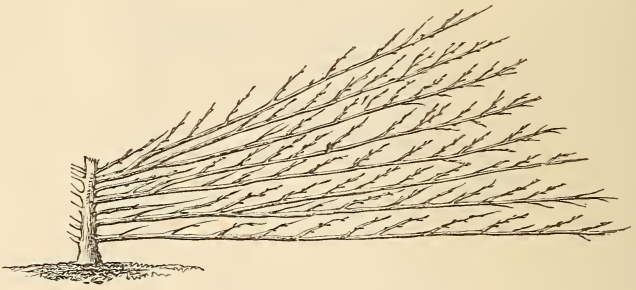


Fig. 18.—Seymour's System of Training.

Cordon Training.—Peaches are often trained as single and double, vertical or oblique, also as horizontal Cordons, either for growing under glass or against walls. The single Cordon (Fig. 9), answers well for special purposes. It is formed by allowing a maiden tree to escape the knife, and the leader is trained on in an oblique or vertical form without being pinched or shortened, so long as plenty of side shoots or laterals can be obtained, until it has attained the required height. All side shoots are pinched at the fifth or sixth leaf, and re-pinched to induce the formation of flower-buds from which fruit can be taken in the second year. Trees of this kind are not long-lived; but they are well adapted for giving a little fruit before permanent trees come into bearing. They also offer facilities for testing a number of varieties within a limited space, and on this account are interesting to amateurs and others who wish to make themselves thoroughly acquainted with the numerous kinds now under cultivation.

Fig. 19.- Cordon Training.

If it is intended to cover a given space with Cordons in the shortest possible time, a sufficient number of clean, strong, evenly-grown maidens should be selected, and planted two feet apart where they are to remain. Autumn is the best time to plant, either before or immediately after the leaves fall. The root-space should be limited, as the system is the reverse of that now generally adopted, and the borders should be composed of sound, friable, calcareous, but not over-rich materials, which will favour the formation of an abundance of fibrous roots and flower-buds. Manure will not be needed until the trees begin to bear, when it may be applied as a top-dressing or mulching. If carefully planted and well watered, a few weeks will suffice for the formation of fresh roots, when all the side shoots must be cut back to a single bud, and a small piece may be taken off the tip of the leader when perfect maturation is doubtful, otherwise the leaders can be left the whole length, when the terminal bud will continue the growth until the allotted space is covered. The next operation will be the regular pinching of side shoots, when they have grown, say, six inches. Those nearest the top of the tree generally start first, and on this account they should be pinched first to throw the sap into the buds nearest the base of the shoot. When these have been stopped all growths must be tied in to the trellis or wall, taking care they are not so close to each other as to prevent the proper development of the buds and foliage. If the young leaders do not show a disposition to furnish plenty of side shoots for future pinching, they may be stopped when they have made eighteen to twenty-four inches of growth, to strengthen and burst the back buds, when they will start fresh leaders and grow on again, to be again stopped if necessary. If the compost is not too rich, the side growths at the end of the season will consist of rather strong shoots, plentifully furnished with wood-buds, and weaker growths studded with flower-buds, with a wood-bud at the base and another at the point. These must be left full length, as the removal of the point-bud would cause the shoot to die back to the base-bud, and the crop of fruit would be sacrificed to false pruning. The stronger shoots, not so plentifully set with flower-buds, unless they are wanted to furnish a perfect specimen, must, however, be cut back to the lowest leaf-buds for giving

the next year's supply of bearing wood. When in the second year the fruit is thinned and swelling freely, the points must be pinched out of all the bearing shoots, and those started from the base regularly laid in and again stopped, when they have made six inches of growth, to induce the formation of a successional relay of fruit-bearing wood. As this will require all the light and air that can be given to it, the bearing wood must be cut out as soon as the fruit is gathered; but the shortening of stronger shoots to a single leaf-bud must be deferred until the winter pruning. Although trees trained and manipulated in this way produce plenty of fruit, the roots in course of time get too strong and powerful for the limited area of the heads. To counteract this and keep them within bounds, full-sized trees can be lifted with good balls as soon as the foliage is ripe, and after having all the strongest shoots shortened with a sharp knife, they can be re-planted into a little fresh loam without endangering the succeeding year's crop of fruit.

Horizontal Cordons are formed by heading back a maiden tree and training two shoots in opposite directions along a trellis wire (Fig. 19), but they are of little use in an ordinary Peach-house, and will not be again referred to. In the Orchard-house they are more useful, and have been noticed.

Root-pruning (see also Root-pruning of the Apple).—When young trees are planted in rich borders and trellis-room is limited, they sometimes require partial lifting to throw them into a fruitful state. The best time to do this is as soon as the foliage is ripe and ready to part from the nodes where the fruit and wood buds are properly formed, and not likely to shrink or shrivel after the roots have been disturbed. It is not, however, a good plan to be constantly checking and disturbing the roots if it can be avoided, as the fruit the following year is never so fine, and unless very carefully performed, the trees, whose head-room is not increased, in the course of a year or two again become gross and unmanageable. To avoid having to lift the trees, sound, rather tenacious, resisting loam, free from all kinds of animal manure, should be used, as has been advised for making the borders at the outset; the latter should be made piecemeal, well drained, and not too large or deep. Moreover, they should be inside the house, where the roots as well as the wood will get thoroughly ripe before the leaves fall. With these precautions as a guide, combined with judicious cropping and the persistent pinching of gross shoots through the summer, the violent measures we sometimes see resorted to can often be commuted to a moderate check which will answer the purpose.

When root-lifting has been decided upon, like all other operations of a similar nature, it should be performed quickly. Take out with spades and steel forks a trench round the extremity of the roots and quite down to the turf on the drainage; then with the greatest care work steadily inwards towards the stem of the tree, saving all the tender roots and fibres as they are found in the soil. When the strong roots, which have been the cause of the trees becoming too robust, have been found, most likely working in the drainage, raise them carefully, preserving all the fibres, and place them on the top of the ball, where they can be kept moist and shaded. Then correct the drainage and stratum of turf, and return a portion of the compost into the trench, beat it firmly and evenly, and spread a little fresh loam over it as a bed for the roots. Cut the points off them as they are relaid but do not reduce them, as lifting alone will produce the required check. Replace a thin stratum of the old soil with a little more of the new loam, beat it firmly, and flood the trench with pure water. Syringe the foliage if it flags, and defer filling up the trench for a day or two, or until the recently watered soil has become firm. When Peach-trees are root-lifted before they lose their leaves, it is wonderful how quickly they commence making new roots in the yet warm, moist soil, and how kindly they break into growth in spring, when as a rule every blossom opens and sets perfectly.

Extension-trained trees rarely require root-lifting, as the broad expanse of wood and foliage keeps pace with and properly balances the roots. Neither are trees in elevated, and as a consequence naturally warm borders, or borders which are confined within certain limits, likely to grow too strong. What the Peach enjoys is a well-drained, firm loam, through which an abundance of small fibrous roots will work their way to the undisturbed surface in search of food, supplied in the form of mulching or diluted liquid. When planted in light, yielding soil, a few strong roots run away beyond their limited space or into the subsoil, from which they force up crude sap late in the season; but being sparely furnished with active spongioles, the fruit frequently ripens off when it ought to be commencing the last swelling.

RENOVATING.

In course of time old trees become weak, and although they may blossom freely and set plenty of fruit, it decreases in size and quality. If the borders are examined, it will be found that the compost has become inert, heavy, and impervious to the influence of sun and air, and that the young roots made in summer, owing to coldness and sourness of the soil, perish in winter. Some twelve to

eighteen inches down in the border, the loam, at one time good, may still be better than that near the surface, and the main roots may be in a satisfactory state but destitute of fibres. If manure as a mulching would correct this evil, the quantity always present would go far to prove that it ought never to have found its way into existence, but manure only aggravates it.

There are two ways of dealing with trees when they get into this condition. The first remedy or mode of renovation adopted by many Peach-growers is neither difficult to explain nor perform. It is simply the removal of all the surface soil from the border quite down to the roots, care being observed that the latter are not injured in the operation, otherwise they will throw up numerous suckers. The roots are then still further exposed by working round the strongest with a hand-fork, and cutting away any parts that are dead or gouty. The whole of the space so cleared is then filled up with good compost similar to that used for making new borders, and the work is complete. Roots very soon find their way upwards into this compost (it is surprising how roots will travel a considerable distance, apparently out of their way, to get into new soil), and the trees very quickly put on an improved appearance; but the alteration may not be without alloy, as some deeply-seated root may still prove troublesome when the fruit is setting, and again when it is ripening.

The other remedy is an extended or elaborate mode of root-lifting, not root-pruning, as every root and fibre must be saved intact and re-laid in new compost. The best way to do this is to commence with steel forks at some distance beyond the radius of the roots and, after working out a deep trench, gradually and carefully remove the soil in the direction of the bole of the tree. When all the worst soil has been removed and the subsoil roots have been raised or cut through, then the work of making up again must be commenced. After correcting the concrete and drainage, trim all the mutilated roots with a sharp knife, raise the points as near the surface as they will come without cracking, then, with the hands and a short rammer, pack up every hole and cranny with good turfy compost containing plenty of old lime rubble. Having got away from the ball, make up the bed and re-lay the roots all over its surface, cover lightly, and water as before.

When very old trees have not been disturbed for a number of years, the complete renovation of the borders may, and most likely will, produce a check and a shock from which it will take them some time to recover. To steer clear of this dilemma, the work may be performed piecemeal, that is, one side of the tree can be root-lifted one year, and the other in the year following. No shock will then be felt, neither will there be any danger of losing a crop of fruit.

FORCING.

Time to Commence.—This must of course be regulated by the period at which the earliest fruit is expected to be ripe, five or six months being allowed from the time the house is closed for forcing. Some skilful growers, having every convenience at their disposal, including a number of houses or compartments, succeed in ripening Peaches in April; but beyond the fact that they are Peaches, it is doubtful if they are of much value. Others do not attempt to have their fruit before the 20th of May. And the period over which this early forcing extends very nearly reverses the season of the tree's growth in this country. To have them in April, it is not good management to attempt forcing permanently planted houses like Figs. 1 and 2. It is better to defer starting these until December and January, and trust to very early kinds established in pots or raised borders, to which gentle heat can be applied, for a few dishes to commence with. Many of the very early kinds, not mentioned in the preceding lists, because extreme earliness is their chief recommendation, answer best for this purpose; but as they have been fully treated upon and discussed in the treatise on Orchard-houses, pot culture will not require further comment here. Assuming then that the lean-to Peach-house is planted with Abec, Hale's Early, and Early Grosse Mignonne Peaches, Lord Napier and Elruge Nectarines, from which fruit is to be gathered before the end of May, it should be closed on the 1st of December. To keep up the supply the second house (Fig. 2), planted with the same kinds and perhaps one or two of the varieties mentioned in the mid-season selection, should be closed on the 1st of January. A third house, either a lean-to or a span-roof, containing the cream of the mid-season Peaches and Nectarines, about the beginning of February, when the late and latest houses, which have been retarded by abundant ventilation all the winter, will follow in the order of flowering through March and the early part of April.

When the month of December proves severe or very dark and unpropitious, the early house does not make so much progress during the first few weeks as the second house does; but, being planted with good early kinds, the fruit can be carried rapidly through the last stages of its growth quite up to the finish. It is not, however, a wise course to pursue if hard forcing can be avoided, as the finest and best-flavoured Peaches are always obtained from trees to which plenty of time can be given; indeed, the

successful forcing of all kinds of stone-fruit depends upon the way in which they are started and carried through every stage, until the most critical one of all, that of stoning, is complete. Old-established trees, to which early forcing has become a part of their nature, stand it better than young ones, and in course of time burst into flower with a modicum of warmth that would not affect others that have never been forced. This condition is of course the result of many years' good and patient management, and proves to the young beginner how important it is to proceed step by step until the object he has in view is attained. No one thinks of suddenly changing the routine of a set of Peach-houses by starting the late house first, and the early house last. Neither does an experienced forcer distress a set of young trees by shutting them up for the first time in November, a period of rest being absolutely necessary. But provided he has plenty of houses in the best possible condition for succession, he would commence the first season towards the end of December, in the second year two or three weeks earlier, and so on until by degrees the trees would lose their leaves early and go to rest, while late houses were yet carrying fruit.

Where not more than two or perhaps three Peach-houses exist in a private place, very early forcing is by no means advisable, as the first crop would be obtained at great expense and risk, and the other one or two houses would not keep up the supply until trees on open walls came into use. Under such conditions the first day of January and the middle of February would be early enough for the first and second houses, and the last might be allowed to come on quietly with full air and no more fire-heat than would be needed for keeping out frost.

Preparation of the Trees and House.—Having pointed out the danger of undue haste in forcing the Peach, we will now refer to the different operations and conditions which must be performed and observed in its management from the time the house is closed until the fruit is ripe, gathered, and disposed of. The first house being considered fit for forcing in December, preparations should not be delayed beyond the middle of October: three weeks earlier will do equally well if the trees are leafless and at rest, if Peaches ever do rest. If the house has been stripped for a few weeks for the twofold purpose of refreshing the trees and borders with rain and dew, and getting the lights painted, see about having them put back in their places: but on no account shut the house up, otherwise, the weather being warm through the day, some of the flower-buds may begin to swell. Loosen all the shoots from the trellis and perform the necessary pruning, be the mode of training extension or restrictive.

If the first, a careful clearance of old fruit-stalks and unsatisfactory pieces that were missed at the time the fruit-bearing wood was cut away will make up the sum-total of pruning. Then wash all the woodwork of the house and trellis with strong soapy water, and paint if necessary. Also wash the trees with lukewarm soapy water, using a rather hard brush for scrubbing the old wood, and a softer and smaller one for the young shoots. If the trees have been free from spider and scale, the wash may be made by whipping two ounces of soft-soap in a gallon of water; but these pests having been troublesome, it can be used double the strength; or four ounces of Gishurst compound, thoroughly dissolved in the same quantity of water (one gallon), will be found satisfactory. When washing the young wood, be careful to draw the brush upwards with the buds and never against them, as they are easily injured. Carefully wash every bit of the young and old wood, and repeat the washing wherever insects may have gained a lodgment. If dressing of any kind is in favour, apply it as soon as the trees are dry, but on no account use it strong, as many trees are much injured by the dressing, not unfrequently after they have been made perfectly clean by the simple process of cleansing with soap and water. Many people now object to painting every bit of wood, and so hermetically sealing the pores in the bark, and securing the larvæ of insects against injury until the time arrives for them to develop into life, when the trees are again started into growth. If a tree is clean, leave well alone; if it is not clean, wash the young wood over and over again, and confine the painting to the old shoots and branches, using six ounces of Gishurst compound dissolved in a gallon of water, to which a little strong finely-sifted loam may be added to give it the consistency of paint. If Gishurst is objected to, the good old recipe: soft-soap, four ounces; sulphur, eight ounces; and tobacco-water, one pint, may be used. Thoroughly dissolve the soap, and work the sulphur into a paste; put them together, add four quarts of water, and a little fine soil and cow-dung to give the mixture the body of paint. When all the trees are cleansed sling them to the trellis until they are quite dry and fit for tying-in. In the meantime wash the walls with quicklime and sulphur, and keep the house well ventilated.

Tying-in is an operation that can be performed at any time before the house is closed for forcing. The main branches should be placed in position, loosely at first, and altered as may be found needful, until a pleasing and symmetrical framework has been secured. Then with stout string tie each branch to

the trellis, and proceed with the arrangement of the minor shoots. As every branch and shoot starts from one centre, the minor growths should run nearly parallel with each other, but in such a way as to increase the distance between them as they extend from the centre, or there will be confusion when the next set of laterals is laid in.

Avoid tying tightly, particularly in young trees, and never attempt to draw a crooked shoot straight by tying a piece of matting round the point and then tightening it to the next wire ahead. This is often done; but it is a bad practice, as the point of the yearling shoot thickens during the summer, and the tie cuts it nearly through, or rather, prevents it from swelling when the sap begins to descend. Some Peach-growers prefer laying in the leaders, and leaving all the fruit-bearing wood loose until the blossoms are nearly open, asserting as their reason that the sap flows through loose shoots with more freedom. There can be no doubt as to the soundness of this view; but where a great number of houses require attention it is not always convenient to do this work piecemeal. Whenever the young wood is tied in, whether before or after the flowers open, one thing should always have attention, and that is, their arrangement in such a way that their foliage will shade the older shoots and branches. If practicable, it is a good plan to tie young wood quite on the top of old branches for this purpose, as many fine limbs go off quite suddenly in hot summers; and no wonder when we consider what they endure, with every leaf and shoot spread out on a trellis to the full blaze of the sun within twenty inches of a fiery glass roof, and with every square foot of trellis carrying a Peach, all to be supplied with moisture through these bare old stems, while the root-supply of water is sometimes administered with a niggardly hand.

Preparation of the Borders.—Assuming that trees in early houses have good internal borders, and that the external arrangement is limited to a few feet of compost, it will be necessary to do all that can be done for the hard-worked and often badly-treated roots, at least once a year. Where any root-lifting or rearrangement takes place at the fall of the leaf, all top-dressing is generally done at that time; but if nothing of the kind is needed, then about the same time all surface dressings, consisting of inert or washed-out manure, should be removed quite down to the border. If the latter has become heavy and pasty, and the trees are old, an inch or two taken away from the surface and replaced with sweet calcareous loam and old lime rubble will stimulate the surface fibres into the formation of new spongioles before the house is closed for forcing. Some defer top-dressing until after the trees are tied in; but the best time to replace the old with new is immediately after the crop is gathered. Shortly before the house is closed, a quantity of fresh fermenting leaves, laid in a ridge along the centre or front of the borders, will give off moisture, and facilitate the swelling of the buds in mild weather without the aid of much fire-heat. External borders, it is scarcely necessary to say, should be well covered with dry leaves or litter, and protected from cold, rain, and snow by tarpaulin, or, best of all, sheets of corrugated iron. This material is now coming largely into use, and may be considered one of the indispensables, where early forcing is carried on, as it is cheap, durable, and easily stowed away in small compass when not wanted over the borders.

Temperature.—One of the great secrets of success in forcing first-class Peaches is bound up in the word "patience." An easily-excited tree which naturally flowers early can be brought on quickly, but with what result? The embryo flowers existing within their hoary coverings are excited too fast at first, when they either drop off or open in an imperfect form, and are incapable of performing their functions. Sometimes all the parts of the flowers are present, but weak, and the anthers are destitute of pollen, without which fertilisation is impossible. To avoid this dilemma, time must be given to the trees through the early stages, by starting them at a low temperature, by coaxing them forward on bright days with gentle fire-heat and ventilation, and allowing them to rest at night. The flowers will then keep in advance of the wood-buds, which is not always the case, particularly in young trees, when they are brought on in too high a temperature.

During the first fortnight after the early house is closed, no more fire-heat should be given than will be necessary to prevent the temperature from falling below 45° at night. In mild weather, it will range much higher with ventilation; and when very cold, a few degrees lower will be preferable. When the house has been shut up about fourteen days, and fermenting Oak-leaves have been placed in a ridge along the border, warm the pipes every morning, always with a little air on the ventilators, to raise it to 55° or 60° under the influence of gleams of sunshine. Shut it off in the afternoon, and let it again descend to 45° on cold nights, and 50° when the external air is soft and mild. When the buds begin to swell freely, apply just enough fire-heat to maintain a steady minimum of 45° to 50°, and a maximum of 55° to 60°, always with a chink of air on the top and bottom ventilators, and let external conditions be the guide in departing from these

figures. Many Peach-growers do not think it necessary to give air through the early stages; but buds as well as leaves are always strengthened by having a circulation, and although progress may not be quite so rapid at first, the result in the end is always satisfactory. Therefore, in order to secure a vigorous bloom that will set well, always force with a circulation of air. When the blossoms begin to open freely, 50° at night and 60° by day may be taken as the mean until the fruit is set; but the amateur need not be afraid of allowing the house to fall as low as 40° by daylight in severe weather, as Peaches will and do frequently set well when the mercury sometimes almost touches the freezing point. This close sailing is not however advisable, if it can be avoided; but for the benefit of those who have not had much experience in the matter, it may not be out of place to make this point as clear as possible by assuring them that low night-heats will do no harm. On the other hand, warmth from fermenting materials combined with sun-heat sufficient to raise the house to 70° will be beneficial during the time the trees are in flower, as it ripens the pollen and sets it at liberty in bright golden showers when the air is warm and buoyant.

After the fruit is set, renovate the fermenting material to counteract the drying influence of the hot-water pipes, and let the external temperature be the guide in the maintenance of the internal heat, allowing it to range from 56° to 60° at night, and 10° higher through fine days. In this way giving and taking, as the elements are favourable or the reverse, carry the fruit up to the stoning process. When this period arrives, the fruit, to all external appearance, will come to a dead stand; but so long as it does not turn yellow and fall off, there will be no occasion for alarm, as the trees are undergoing a hard and trying strain in supplying the calcareous matter so essential to the formation of the stones. As the stoning process will keep the fruit for some four or five weeks at a given size, a steady day and night temperature at or about the last-named figures will give the trees and the fruit plenty of time to go through their work; they will then begin to move, and move rapidly through the next swelling. Then, and not till then, time must be caught up, which was apparently lost through the early stages, by running up to 75° or 80° after the house is closed with sun-heat. But unless time is a very important object, hard forcing should be discountenanced, as the largest and best-flavoured Peaches are invariably gathered from trees that can have rest by night and moderate forcing through the day. From these remarks it must not be inferred that a higher temperature would be fatal, as Peaches in pots are sometimes ripened off in Pine-stoves, but the fruit from trees so managed is inferior in flavour. Moreover, while ripening off a crop of Peaches, another set of firm, short-jointed shoots must be secured for the succeeding year, otherwise the increasing earliness which is to be observed in starting the trees in succeeding seasons will soon come to an end, as it is of no use trying to start a house in November unless the wood is in a satisfactory condition.

It is hardly necessary to say that a house started one year in December, will more readily respond to the same heats in the following year, although it may be closed a little earlier; while houses that are started later, say in January and February, when forcing is no longer dead against nature, and solar heat and light are in the ascendant, will stand an all-round rise of five degrees with impunity.

Late houses that are allowed to break naturally or with gentle excitement by closing in the afternoon, do not really require fire-heat at all, unless the nights are frosty or the atmosphere is thick, cold, and laden with moisture, when gentle warmth from the pipes is of the greatest service, not only for keeping out the damp air, but also for ripening the pollen and keeping the petals dry when the trees are in flower. With the exception of this short period, fire-heat, until the wood requires ripening, is not absolutely necessary for the production of the finest Peaches that an English grower can obtain.

The latest houses, as well as wall-cases from which very late crops are required, do not receive winter firing unless the weather is unusually severe, and there is danger of the buds, which may have got a little forward, being killed. At all other times, by night and day these structures are kept fully ventilated, and as cool as possible, to retard the flowers. When the flowers open, a little heat may be needed to keep the petals dry and set the pollen at liberty, otherwise shy kinds like Walburton Late Admirable do not always set well. After the fruit is set extreme ventilation is again resorted to and fire-heat is dispensed with, until it is again wanted in the autumn to ripen up the wood.

HOT-HOUSE OR STOVE PLANTS.

By William Hugh Gower.

Mackaya.—Acanthaceous plants of great beauty. The name commemorates Dr. Mackay, the author of the "Flora Hibernica;" it is unfortunate, however, that there is another genus *Mackaya*, in the order *Loasaceæ*, with which this must not be confounded. Pot in peat and loam. Intermediate House.

M. bella.—A handsome shrubby plant, with long, slender branches; leaves three to four inches long,

ovate-acuminate, roughly toothed, and dark green; racemes many-flowered, flowers campanulate, delicate mauve, prettily netted with purple veins. Spring months. Natal.

Macrozamia.—This is a handsome genus of Australian Cycads, some of which attain great heights. Mr. Hill, of Brisbane, says: "The Macrozamias generally grow on open forest lands, among various species of Eucalyptus, Acacias, &c., none of which afford them much shade, and the soil in such situations is usually sandy or stony, and not rich." Soil and treatment same as Cycas.

M. corallipes.—Stem somewhat spherical, stout; leaves diverging at the base, pinnate; leaflets long and narrow, very deep green, the foot-stalks reddish-brown. A very handsome plant. New South Wales.

M. cylindrica.—Stem with a long narrow neck, leaves pinnate, with long, coriaceous, shining dark green leaflets, with an ivory-white petiole. Queensland.

Mamillaria.—A genus of *Cactaceæ*, mostly of small growth, but to the lovers of this order, extremely beautiful; they are more or less globose, oblong, or cylindrical, and seldom exceed eighteen inches in height. They are distinguished by their stems being covered with small tubercles of a teat-like form, bearing upon their summit a tuft of spines of a yellow, white, or red colour, and some authorities have divided them into sections according to the colour of their spines. The name comes from *mamilla*, "a teat," and they are sometimes called Beef-steak Plants, because the fruits have a flavour resembling fried beef. The flowers of Mamillarias are produced from near the summit, and may be called fairly showy, the chief colours being red, white, yellow, and pink, with various intermediate shades. Each lasts several days, but closes every night, to open again in full beauty the following morning; for treatment, see Cereus; and in the plate of a group of Succulent Plants may be seen examples of this genus. The following list comprises some of the most beautiful forms in cultivation:—

M. acanthophlegma.
M. angularis.
M. bicolor.
M. carinifera.
M. cirrifera.
M. clava.
M. conopsea.
M. coronaria.
M. crucifera.
M. densa.
M. echinata.
M. elephantidens.
M. erecta.
M. Fischerii.
M. longimamma.
M. melaleuca.
M. minima.
M. nivea.
M. nobilis.
M. Parkinsonii.
M. Peacockii.
M. Pfeifferii.
M. Phymatothele.
M. Polia.
M. polyedra.
M. pusilla.
M. rhodanthe.
M. Scheidiana.
M. Schlectendalii.
M. senilis.
M. spinosissima.
M. stella aurata.
M. straminea.
M. turbinata.
M. verruculata.
M. Wildiana.

Manettia.—A small genus of climbing plants belonging to the Cinchonads; they are handsome plants, easily grown, and when in flower last long in full beauty. Pot in peat, leaf-mould, loam, and sand, in about equal parts. Stove.

M. cordifolia.—Leaves ovate, cordate at the base, slightly hairy, and dark green; flowers tubular, upwards of an inch long, brilliant scarlet. Summer months. Brazil.

M. micans.—Like the preceding, this is a twining plant; it has large, ovate-lanceolate, dark green leaves; and long, tubular, orange-scarlet flowers. Summer months. Peru.

Maranta.—This is a beautiful genus of ornamental-leaved plants, giving its name to the order. Several species, as *arundinacea*, *nobilis*, *ramosissima*, are cultivated largely for the starch which is obtained from their tubers, and comes into the market by the name of Arrowroot, which name would appear to come from the native Indians using the roots to heal the wounds received from poisoned arrows. Marantas are splendid ornaments in the stove, delighting in strong heat and an abundance of moisture. Pot in peat and loam, with a little sand added, drain well and water freely. Stove.

M. fasciata—leaves broadly heart-shaped; ground-colour deep green, broadly banded with white from midrib to the margin; reverse side pale green, shaded purple. Brazil.
M. hieroglyphica—a dwarf species, with obovate leaves; ground-colour deep green, suffused with emerald-green, streaked with bars of metallic-white, reddish-purple beneath. New Grenada.
M. illustris—leaves ovate; bright green, striped with transverse bands of dark green, the midrib white, tinged with pink; the middle of the blade is traversed from base to apex with two wavy bands of white; reverse side deep purple. Ecuador.
M. Leopardina—leaves pale yellowish-green, regularly marked on each side of the midrib with oblong blotches of deep green. Brazil.
M. Lindenii—leaves oblong; ground-colour deep green, regularly marked with blotches of pale green on each side of the midrib; reverse side rosy-purple, the marking of the upper side showing through. Peru.
M. Makoyana—a dwarf species with ovate leaves; ground-colour deep olive-green, blotched with creamy-yellow, and regularly marked on each side of the midrib with oblong blotches of heavy green; reverse side rosy-red. South America.
M. Massangeana — leaves broadly-oblong; ground-colour pale green, regularly marked between midrib and margin with blotches of greenish-purple. Garden variety.
M. nitens—a small plant having ovate-acuminate leaves of a bright shining light green, marked on each side the midrib with oblong blotches of deep green. Brazil.
M. pardina—leaves ovate, yellowish-green, blotched on each side the midrib with chocolate. Magdalena, New Grenada.
M. Porteana—leaves oblong-acuminate; ground-colour a bright shining green, transversely barred with white; reverse side rich purple. Brazil.
M. rosea-lineata — leaves broadly-ovate, and deep, rich, shining green, transversely streaked with oblique lines of bright rose; reverse side port wine colour. S. America.
M. rosea-picta—leaves orbicular, and deep shining green, marked with a band of bright rose running round midway between the margin and costa; the latter also deep rose. Amazon valley.
M. splendida — leaves oblong-lanceolate, and rich

olive-green, blotched with pale yellowish-green. Para.

M. Veitchii—leaves ovate-elliptic, deep olive-green and shining, variegated with half-moon-shaped blotches of yellowish-green and white; the reverse side is of a vinous-purple colour, showing the markings of the upper side. Western Tropical America.

Medinilla.—A genus of Melastomads, containing many species of great beauty. They are all natives of the islands of the Indian Ocean, and enjoy a high temperature and moist atmosphere. Pot in fibrous loam and turfy peat, with some sharp sand added. Stove.

M. amabilis—a species with dark green opposite leaves, producing in abundance erect racemes of rosy-pink flowers. Summer months. Java.

M. magnifica—a bold-growing species having large, opposite, broadly-ovate leaves, and immense pendulous racemes of rosy-pink flowers. Spring and early summer. Java.

M. Sieboldii—this species is less showy than either of the preceding, but as it blooms through the dull months, it is specially valuable; leaves opposite, oblong, and somewhat fleshy; racemes erect, flowers white, with purple stamens. Winter months. Java.

Mimosa. — A very large genus of *Leguminosæ*, the name coming from *mimos*, "a mimic," from the extreme sensitiveness of the leaves, in many of the species resembling somewhat that of animals. They are plants of easy culture, and should be grown in sandy loam, peat, and leaf-mould. Stove.

M. pudica.—The whole of the species exhibit a fine illustration of the sleep of plants, as the leaves fold up at night, but the species here quoted (sometimes but erroneously named *M. sensitiva*) is remarkable for its peculiar sensitiveness, its leaflets and leaves shrinking from the slightest touch; it is a somewhat dwarf plant of branching habit, having strong prickles upon its stem. Leaves digitate, bearing numerous pinnate, bright green leaflets. Brazil.

Monstera.—A genus of Arads, most of which are climbers; they are of bold growth, with thick and leathery leaves, and are sufficiently hardy to live in a green-house during the summer months, or even to form ornaments in the sub-tropical garden. Pot in peat and loam, in equal parts, giving abundance of water. Stove.

M. deliciosa, so called on account of its large and luscious fruit, which has the flavour of the Pine, Melon, and Peach combined. Leaves large and rich deep green, having perforations in them as if cut out with scissors or knife. Mexico.

MARANTA ROSEA-PICTA.

Musa.—This genus gives its name to the order *Musaceæ*, and contains many bold and handsome-leaved kinds as well as some with beautiful flowers. Smith says: "They are of great importance, producing food for millions of people," and that the area required to yield 33 lbs. of Wheat, or 99 lbs. of Potatoes, would produce 4,400 lbs. of Plantains.

The Plantain, *M. paradisiaca*, and the Banana, *M. sapientum*, have been cultivated from time immemorial, and the varieties produced are as numerous as those of the Apple. Pot in rich loam, and water abundantly. Musas enjoy a high temperature and moist atmosphere, therefore must be kept in the stove.

M. Chinensis—a dwarf species seldom exceeding five or six feet in height, with deep green oblong leaves some three feet in length and two feet in breadth; it is extremely valuable as being not only ornamental, but very fruitful in a somewhat low stove temperature. This plant is found in collections under the names of M. Cavendishii and M. Sinensis. China.

M. coccinea—a slender species, attaining a height of about four feet, bearing a terminal inflorescence; flowers yellow, spathes rich scarlet, tipped with yellow. Summer months. Cochin China.

M. ensete—the gigantic Banana of Bruce; it bears leaves (when fully developed) some twenty feet long, and between three and four feet wide; these are bright green, the stout midrib at the back being vivid crimson, and the stem very stout; fruits not edible. Abyssinia.

M. rosacea—resembles coccinea, but the flowers are beautiful soft rosy-pink. Mauritius.

M. sapientum and its varieties produce the luscious fruits known as Bananas, which are eaten in a fresh state when ripe, whilst the fruits of M. paradisiaca, the Plantain, are usually gathered in an unripe state and roasted. M. sapientum is a bold-growing plant some fifteen or twenty feet high, bearing enormous bunches of pendent fruits weighing upwards of sixty pounds. Tropics.

M. textilis—a tall-growing plant which is very orna-

mental, but its fruits are not edible. From its stems comes the fibre called Manilla Hemp, used in shawl-making, for cordage, and even woven into false tresses for the adornment of the ladies. Philippine Islands.

M. Uranoscopus—similar in habit to M. ensete, but bearing erect panicles of flowers and fruits. Queensland.

M. vittata—a tall plant with the habit of M. ensete, the leaves being dark green, irregularly striped and blotched with white and pale green; fruit not edible. Isle of St. Thomas, Western Tropical Africa.

M. zebrina — a comparatively dwarf and slender-stemmed species, with oblong dark green leaves, irregularly striped and blotched with bronzy-purple. East Indies.

Myristica.—Beautiful stove shrubs, although not showy, and exceedingly interesting as yielding the aromatic spices known as Nutmegs and Mace. The true or best Nutmegs are the produce of *M. moschata* (sometimes called *M. officinalis*), and are principally grown in Malacca and Penang, while inferior Nutmegs are the produce of such species as *M. fatua, sebifera, acuminata*, &c. Pot in two parts of loam and one of peat, with some sharp sand added. They enjoy a strong heat and moist atmosphere.

M. moschata is a tree from twenty to thirty feet high, with large, oblong, dark green, aromatic leaves, and in a young state forms a handsome bush. The fruit is about the size of a green Walnut; when ripe it bursts open, and discovers the seed, enclosed in a fleshy arillus of a beautiful crimson colour. This is the Mace of commerce, which, after being dried in the sun, changes to golden-yellow. The seed is the Nutmeg. This plant is largely cultivated in the Bunda Islands, and usually produces three crops in twelve months.

Monstera Deliciosa.

Napoleona.—A small family, with respect to which much diversity of opinion prevails amongst botanists. By some they are made into a separate order under the name of *Napoleoneæ;* by others they are placed in *Belvisiaceæ*, but popularly they are known as Mock Passion Flowers. They are handsome shrubs, enjoying a strong moist heat. Pot in two parts of loam, one of peat, and one of sharp sand; drain well and water freely. Stove.

N. imperialis.—This is a medium-sized bush, with alternate dark green leaves, which are oblong, and leathery in texture; flowers axillary, sessile, two or three together, somewhat resembling a Passion Flower in shape—of a creamy buff-crimson colour. Summer months. West Africa.

Nepenthes.—This genus constitutes the order *Nepenthaceæ;* they are climbing plants with alternate leaves, having the apex suddenly contracted into a long tendril, which terminates in a receptacle in the form of a jug or pitcher, that is furnished with a lid; this, when the pitcher is young, is hermetically sealed, but when mature opens more or less wide. This appendage, which is often beautifully coloured, and which is the chief ornament of the plants, has caused them to be popularly known as Pitcher Plants, of which many fallacious stories have been written. There are numerous species, most of them natives of the Indian Archipelago, some of which produce enormous jugs, besides which, many new varieties have been obtained by cross-breeding both in English and American gardens.

Nepenthes are surface-rooting plants, and should be potted in rough fibrous peat and sphagnum moss; drain well and water freely, both from watering-can and syringe. They enjoy a strong heat and moist atmosphere, but must not be exposed to the full influence of the sun. Stove.

N. albo-marginata—all these plants have broad-oblong leaves, therefore it will only be necessary to describe the curious ascidia or pitchers; reddish-green, bordered round the rim with white. Borneo.

N. ampullacea — pitchers ovate, bright apple-green, ornamented in front with a double-fringed wing; lid small; in the varieties picta and major the pitchers are profusely blotched with yellow; wings broad and fringed. Garden variety.

N. bicalcarata — pitchers about six inches long, and nearly four inches across at the base, which is the widest part; pale crimson, streaked with numerous, parallel, oblique ridges; wings in front deeply fringed; at the base of the lid are two prominent, strong, spiny spurs. Borneo.

N. coccinea — pitchers about six inches long, cinnamon-brown. Indian Islands.

N. atrosanguinea—pitchers upwards of six inches long; reddish-crimson, sparingly spotted with

Musa Sapientum.

narrow above; crimson, freckled with yellow; wings broad and fringed; throat green, speckled with red; the rim broad, beautifully striped with red and black; lid same colour. Garden variety.

N. distillatoria—sometimes called Zeylanica; pitchers about eight inches long; bright green; there is a variety with deep red pitchers, called rubra. Ceylon.

N. Dominiana—pitchers cylindrical; six inches long; deep green. Garden variety.

N. Dormaniana—pitchers upwards of six inches long and nearly three across; deep crimson, mottled with greenish-yellow, lid blotched with red. Garden variety.

N. Hookeriana — pitchers broadest at the base; as the plant begins to climb, however, the lower pitchers lengthen and become narrower, tapering to the base; colour deep green, marbled and streaked with reddish-brown. Sarawak.

N. hybrida-maculata — pitchers nine or ten inches long; dark green, profusely streaked with reddish-purple. Garden variety.

N. lanata—pitchers upwards of ten inches long and four inches broad, clothed with short woolly hairs, winged and ciliate in front; light green, with a broad-ribbed reddish-brown margin. Borneo.

N. Lawrenciana—pitchers somewhat obtuse, beautifully winged and fringed in front; ground-colour pale green, covered with deep crimson blotches. Garden variety.

N. Outramiana — pitchers about five inches long; yellowish-green, profusely spotted with blood-red. Garden variety.

N. phyllamphora—pitchers long and cylindrical, about ten inches long, destitute of wings in front; apple-green. Borneo.

N. Rafflesiana—pitchers six to twelve inches long; a deep green, profusely mottled and spotted with red, winged and fringed in front. This, like N. Hookeriana, may be found with two forms of pitchers. Borneo.

N. Rajah—pitchers upwards of a foot long, and six inches in diameter; fringed and winged in front, and capable of holding a quart of water. Borneo.

N. Ratcliffiana — pitchers swollen at the base, narrowing upwards, winged and fringed in front; greenish-yellow, profusely mottled with bright red. Garden variety.

N. robusta—pitchers swollen at the base, tapering upwards, winged and fringed in front; green, mottled with red-dish-brown. Garden variety.

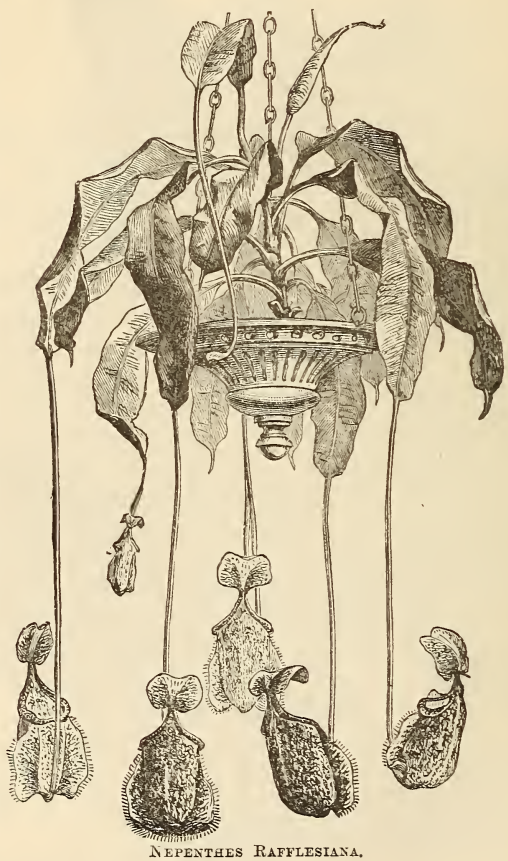
N. rubro-maculata—pitchers nearly six inches long; yellowish-green, spotted with vinous-red. Garden variety.

N. sanguinea—pitchers cylindrical, but slightly swollen at the base, about a foot long, and nearly three inches in diameter; colour deep crimson. Borneo.

N. Sedenii—pitchers freely produced; bright green, profusely spotted and blotched with dark red. Garden variety.

N. Williamsii—pitchers four to six inches long, winged and fringed in front; green, but nearly covered with mottlings of blood-red. Garden variety.

N. Wrigleyana — pitchers slightly swollen at the base; ground-colour pale green, profusely mottled with rich crimson. Garden variety.



Nepenthes Rafflesiana.

Nidularium.—A genus of Bromeliads, containing many handsome species; their growth is rosulate, and the sheathing base of their leaves closely imbricate, enabling them to hold water in the centre, which the plant enjoys. Peat and a little loam.

There are other beautiful species besides those named here; amongst which we may name *Morreenianum*, *Scheremetieffi*, *Meyendorfii*, *coriaceum*, &c.

N. Innocenti—plant stemless, leaves strap-shaped, spreading and recurved; edges armed with small teeth-like spines, upper side dark green, reddish-purple beneath; the globose heads of bloom do not rise above the leaves; flowers rich red, tinged with orange. Winter months. Brazil.

N. Lawrentii—an elegant species, similar to the preceding in habit; leaves green, dotted with brown, passing into a greenish-white at the base; reverse side a plain deep green; flowers soft clear blue. Winter months. Brazil.

N. spectabile—leaves broadly-ligulate, upwards of a foot in length, and nearly two inches in breadth, fringed on the edges with small teeth-like spines; deep green above, grey below, transversely banded with scurfy white streaks; the ends of the leaves, nearly an inch down, are a deep reddish-crimson; the flowers are a bluish-violet; calyx very large, standing up amongst the flowers like blood-red bracts. Winter months. Brazil.

Panax.—A genus of *Araliaceæ*, containing many handsome ornamental-foliaged plants; indeed, some of the plants assigned to this family may be true Aralias; to this genus belongs the famous "Ginseng" (*P. Schinseng*) of the Chinese, the root of which was said to cure all ills that flesh is heir to. These plants form beautiful objects in the stove, and when young are admirably adapted for the decoration of the dinner-table. Pot in a mixture of two parts of peat, one of loam, and a small portion of sand. Stove.

P. dissectum — a much-branched plant, with pendent twice-divided leaves; leaflets cuneate and bilobed, toothed on the edges, and deep green

P. elegans — leaves very finely divided, and dense rich deep green; a fine decorative species.

P. excelsa — leaves compound; leaflets much di-

vided, and armed at the edges with white spiny teeth; upper side deep green, reverse much paler.
P. laciniatum—leaves somewhat pendent and very broad, bipinnate; leaflets much divided and irregular in shape; bronzy-green. South Sea Islands.
P. plumata—leaves bipinnate; the leaflets deeply divided, and the edges furnished with numerous teeth-like spines, which curve upwards, giving to the whole plant a very crispate appearance; colour deep green. South Sea Islands.

Pandanus.—Popularly known as Screw-pines, the leaves being arranged in a spiral manner, which, combined with their resemblance to those of the Pine-apple, has given rise to the name. All these plants are very ornamental in a young state. Pot in loam and sand, drain well, and water freely. Stove.

P. elegantissimus — leaves narrow, one to three feet long; deep green on the upper side, paler beneath, armed at the edges and back of the midrib with sharp red spines, and suffused with a glaucous bloom. Mauritius.
P. Javanicus variegatus—leaves two to six feet long, recurved; brilliant green, banded with white, armed at the edges and back of the midrib with sharp white spines. Java.
P. ornatus — leaves broad, three to six inches long; dark shining green on the upper side, paler and glaucous beneath, armed with white spines. Philippines.
P. Pancherii—leaves long and narrow; deep green, covered with a glaucous bloom, and armed with white spines. New Caledonia.
P. utilis—this species is cultivated for its leaves, which are used for making sugar-bags, and after their arrival in this country, are cut up and made into the baskets in which the city man carries home a choice bit of fish. Leaves broad, three to six feet long; glaucous green, edges and back of midrib armed with red spines. Mauritius.
P. Vandermeerschii — a miniature of the preceding; leaves narrow; dark green, glaucous at the base, and armed with deep red spines. Mascarene Islands.
P. Veitchii—leaves broad and recurved; brilliant shining green, broadly margined with pure white, and armed with white spines. South Sea Islands.

Parmentiera.—A genus belonging to the order *Crescentiaceæ*; it contains but two species; the flowers are not conspicuous for beauty, but they are handsome foliage plants. Pot in loam and peat in equal parts, adding some sharp sand. Stove.

P. cereifera.—(the Candle Tree).—This plant attains a height of about twenty feet; the leaves are trifoliate and dark green, the fruits are cylindrical, some three feet or more long, and about one inch in diameter. Seemann says: "The fruits have quite the appearance of yellow wax candles, and a person entering the forests composed of this tree almost fancies himself in a chandler's shop, for from all the stems and older branches these fruits are suspended. They have a peculiar Apple-like smell, and are used for fattening cattle. The fruits of the only other species, *P. edulis*, are much relished by the Mexicans, and they are called "Quankhichotl." Panama.

Passiflora.—We have in the green-house section of this genus given details of soil, &c., and it will only be necessary to add here that the following species require the heat of the stove.

P. alata—all the species here quoted are strong climbers, requiring considerable space to develop their beauties. Stems winged, leaves entire, heart-shaped; flowers large and fragrant, deep crimson, the rays being marked with green and rosy-purple. Summer months. Peru.
P. amabilis — a profuse bloomer; flowers bright scarlet, corona white. Summer months.
P. Belottii — flowers soft pink and white. Summer and autumn months. Garden variety.
P. Buonapartea — flowers large, red, white, and blue, and very handsome. Summer months.
P. fulgens—flowers medium-sized and freely produced, brilliant scarlet. Summer months. Amazon valley.
P. Hahnii — an abundant bloomer; flowers medium-sized, creamy-white, corona yellow. Summer months. Mexico.
P. kermesina—a most profuse bloomer, flowers rich deep crimson. Summer months.
P. macrocarpa — a strong grower; flowers large, white and reddish-purple; its fruits are edible, and weigh from six to eight pounds. Forests on the Rio Negro.
P. princeps — flowers medium-sized, intense bright scarlet. Summer and autumn months. Brazil.
P. quadrangularis — the fruits of this species are edible, and are known by the name of "Granadilla," they are oblong, and weigh from three to four pounds; the flowers are large and fragrant, white, red, and violet. Summer. Tropical America.

Paullinia.—These plants belong to the Soapberry family (*Sapindaceæ*); one species (*P. sorbilis*) produces the cooling beverage called "Guarana," largely used by the Indians of the Amazon, and Brazilian miners; it is produced by the seeds, and is said to have the same properties as tea. Another species, *P. Curassavica*, produces the walking-canes known as "Supple Jacks." Pot in peat, loam, and sand. Stove.

P. Oceanica.—A slender-growing plant, with alternate pinnate leaves; leaflets variable in shape, toothed on the edges, and deep green. South Sea Islands.

P. thalictrifolia.—Leaves much divided, resembling those of a Thalictrum, or Maiden-hair Fern, in a young state; these are bright rose, changing with age to green. There is also a variegated form of this plant. South Sea Islands.

Pavetta.—A genus of *Cinchonaceæ*, with trusses of white flowers in the way of Ixoras; the plant here quoted, however, is most remarkable for the beauty of its leaves. Pot in peat, loam, and sand, in equal parts. It delights in a strong moist heat, with full exposure to sun and light. Stove.

P. Borbonica.—A beautiful shrub, with opposite, oblong-lanceolate, acuminate leaves, some nine or ten inches long; deep olive-green in colour, marbled and freckled with emerald-green and white, midrib reddish-pink. Isle of Bourbon.

Pavonia.—A Malvaceous genus, mostly consisting of small shrubs, some few species of which are

showy ornaments in the plant-houses. Pot in sandy loam, drain well, and water freely. Stove.

P. Makoyana.—A small erect shrub, with oblong-lanceolate coriaceous leaves; deep green; flowers in terminal racemes, calyx large, bright rosy-carmine, from which the dark purple corolla protrudes. Summer months. Brazil.

P. multiflora.—This, like the preceding, is a profuse bloomer; calyx brilliant red, fringed at the edges, corolla deep purple, stamens much exserted, and bright blue. Summer and winter months. Brazil.

Pentas.—A genus of soft-growing shrubs, belonging to the Cinchonads. They are plants of easy culture and great beauty, but require frequent stopping to keep them bushy. The flowers are admirably adapted for cutting for bouquets, or, indeed, any other purpose where choice flowers are required. Pot in leaf-mould, peat, loam, and sand, in about equal parts. Stove.

P. carnea.—Leaves opposite, slightly hirsute and bright green; flowers tubular, with a flat spreading limb, composed of five ovate segments; these are produced in dense terminal trusses; soft pink in colour. Winter months. West Africa.

P. rosea.—A slightly stronger-growing plant than the previous one, differing chiefly in the colour of its flowers, which are a rich deep rose. Winter months. West Africa.

Peperomia.—A genus of Pepper-worts, but with no economic properties; there are an immense number of species, but although all are interesting, few are sufficiently attractive to find a place in the plant-houses of amateurs. Pot in peat and loam, with some sand added. Stove.

P. argyrea — a handsome dwarf plant, seldom exceeding ten inches in height; leaves orbicular, some five inches long, thick and fleshy in texture; bright green, marbled with silvery-white. Brazil.

P. Marmorata—leaves thick and fleshy, ovate and acuminate; bright green, marbled and spotted with white. Brazil.

P. prostrata—an elegant pendulous plant; should be grown in a hanging basket. Leaves alternate, small, nearly round, supported on long pendent thread-like stems, thick and fleshy; ground-colour light green, veined silvery-white, variegated with brown.

Petræa. — A genus of Verbenaceous plants, mostly climbers; they are very showy and deserve greater attention than usually falls to their lot. Pot in equal parts of peat and loam, with a little sand. Stove.

P. erecta.—The leaves of both species are rough, harsh, and very unpleasant to handle; the flowers of this plant are produced in long pendent racemes and are rich bright blue. Summer months. Tropical America.

P. volubile.—A climbing plant, producing long pendent racemes of bloom; the calyx soft lavender, corolla rich violet-purple. Summer months. Mexico.

Philodendron.—A large genus of *Araceæ*, all natives of various parts of Tropical America, most of them are bold-growing plants, climbing the trunks of the forest trees by the aid of their stout aërial roots. As young plants, and before they begin to climb, they are extremely ornamental and well deserve more extensive cultivation; by cutting them down from time to time they can be kept from climbing. Plants of easy culture, requiring plenty of heat and moisture; pot in peat and loam in equal parts. Stove.

P. Carderi—leaves cordate; intense deep satiny-green, the midrib and principal veins light green with a glaucous hue, reverse side reddish-purple, veined with green.

P. elegans—leaves pinnatifid, deep shining green above, somewhat paler below.

P. erubescens—leaves large, cordate; deep bronzy-red when young, changing to dark shining green.

P. gloriosum — leaves cordate; deep bottle-green with a satiny surface, the midrib and principal veins ivory-white, reverse side greenish-white.

P. melanochrysum — leaves medium-sized, and deep green, the upper side burnished with gold.

P. pinnatifidum—a fine bold-growing species, having large deep green pinnatifid leaves; it makes a fine sub-tropical plant in summer.

P. punctatum—this is not a climbing plant; the leaves are deep green and pinnatifid, the large spathes are freely produced amongst the petioles; pure white, spotted with blood-red.

P. Simsii—a grand and massive species, with cordate-acuminate leaves, rich bright shining green above, paler below.

P. Williamsii — this is a superb species with large sagittate leaves of a bright green, with pale green midrib and veins, reverse side light green, veined with heavy purple.

Phyllagathis.—A genus of Melastomads, requiring very strong heat and a moist atmosphere, or the edges of the leaves become brown. Pot in rough peat, leaf-mould, and sand. Stove.

P. rotundifolia.—This is a thoroughly distinct and handsome-leaved plant. Stem stout, quadrangular, about a foot in height; leaves opposite, almost round, measuring from six to nine inches across; the upper surface plaited and polished, intense deep blackish-green, flushed with red, under side deep red, veins prominent; the flowers, which have little beauty, are borne in terminal corymbs.

Phyllanthus.—A large genus of *Euphorbiaceæ*, with much diversity in habit, some of the species being extremely ornamental; their leaves are entire, but so arranged as to present the appearance of pinnate leaves to a casual observer. They enjoy a high temperature and moist atmosphere; pot in peat and a little loam. Stove.

P. atropurpureus—a slender twiggy plant with dull purple stems; the roundish entire leaves are green when young, changing with age to deep purple. South Sea Islands.

P. nivosus—similar in habit to the preceding; the leaves in a young state

being pure snow-white, sometimes mottled with green, and changing with age to bright green. Island of Tauna, New Hebrides.
P. roseo-pictus—beautifully diversified leaves: some are rich crimson, some crimson suffused with a coppery hue, others are cream-colour blotched with green and rose, others green mottled with cream, whilst some have all the colours suffused in one. New Hebrides.

Phyllocactus.—This is a genus of *Cactaceæ*, which do well in an Intermediate House; flowers large and gorgeous, having flat-jointed leaf-like branches, which has led to their being mixed up with Epiphyllums; they differ from this genus, however, in producing their flowers from the side, and not from the points of the growths. Pot in rough loam and sharp sand; drain well, as they cannot withstand stagnant water; during winter just enough to keep them from shrivelling will be sufficient. Dry Intermediate House.

P. Ackermanii — brilliant crimson.
P. anguliger—pure white.
P. biformis—reddish-purple.
P. crenatus—white.
P. latifrons—creamy-white.
P. phyllanthoides—white.

Phyllotænium.—A genus of *Araceæ*, which require abundance of heat and moisture to develop their beauties. Pot in peat and loam, and drain well. Stove.

P. Lindenii.—A very ornamental plant, with large persistent sagittate leaves, which are bright light green, the midrib and primary veins silvery-white. New Grenada.

Pilocereus.—This genus, called the Old Man Cactus, has handsome fluted columnar stems; it is separated from Cereus on account of the long white hairs which surmount the apex, and the flowers being mostly composed of one row of petals. Treatment same as for Cereus.

P. Dautwitzi.
P. Hoppenstedti.
P. Houlletti.
P. nobilis.
P. Peacockii.
P. senilis.
P. Verheyenus.
P. Williamsii.

Pitcairnea. — This genus of Bromeliads is characterised by their slender habit, and some little distinctions in the arrangement of the flowers. The name was given upwards of a hundred years ago to honour one Dr. William Pitcairn, of London, a most zealous collector of plants. They require more water at the roots than most plants of this order. Peat and sandy loam.

P. Andreana—leaves narrow, ligulate, waved, entirely destitute of spines; deep green above, with a slight scurfy tomentum beneath. Spike erect, dense, flowers long and tubular, lower part scarlet, upper rich yellow. Summer months. Chaco, New Grenada.
P. flavescens — leaves recurved, upwards of two feet long, and narrow, destitute of spines; deep green above, white beneath. Flower-spike erect, as long or longer than the leaves, flowers two shades of yellow, sepals golden, petals greenish-yellow. Spring and early summer. South America.
P. pungens—leaves long and recurved, spiny. Flowers rich orange-red. Summer and autumn months. Andes of New Grenada.
P. staminea — leaves very long and narrow, deep green; spikes long and slender; flowers tubular, long, and pendulous, the ends of the petals rolled back, stamens very much exserted, deep reddish-crimson. Winter and spring months. Tropical America.

Plumbago. — *P. coccinea* belongs to the order *Plumbagineæ*; for treatment of the genus see greenhouse division; it is a free-growing, free-flowering plant, and will serve to keep the stove gay through the whole of the dull winter months, with its long panicles of rich bright scarlet blooms. East Indies.

Poinciana.—Handsome Leguminose shrubs allied to Cæsalpinia, which in their native countries assume the proportions of trees. They have been much neglected by horticulturists for plants of less beauty. Pot in rich loam and peat, adding some sharp sand. In winter, Intermediate House; summer, stove.

P. elata is a species with twice-pinnate leaves, and large clusters of golden-yellow flowers. Summer months. East Indies.
P. Gilliesii — leaves bipinnate, unarmed, bright green; flowers produced in large clusters, rich yellow; stamens very long, deep crimson. Summer months. Chili.
P. pulcherrima—this is a dwarf spiny plant, and is much used for hedges; the flowers are red and yellow, and very showy. Summer months. East Indies.
P. regia—leaves bipinnate, bearing upwards of a dozen pairs of leaflets; flowers produced in axillary racemes, rich crimson, very showy. Summer months. Madagascar.

Poinsettia.—A genus of *Euphorbiaceæ*, which has very little, if any, distinctive character to separate it from Euphorbia; when well grown they produce a brilliant effect in the stove during winter. They should be potted in good sandy loam, peat, and leaf-mould, in about equal parts, adding some sharp sand to keep it porous. The plants may be grown in a cool house or frame during the summer months. About September they should be removed into warmer quarters, when the bright bracts will soon begin to appear; after flowering keep the plants dry and cool, with only just water enough to prevent shrivelling until the end of May, when growth may again be encouraged for the next winter's display. The bracts must be kept from damp, or they will soon become spotted and decay.

P. pulcherrima.—This may be grown as single-stem specimens, or as much-branched shrubs, according to the pleasure of the cultivator; the flower-heads are composed of small green blooms, but the numerous brilliant scarlet bracts which surround them are very showy. There is a form with white bracts, called *alba;* another in which the bracts are very numerous, giving the head a double appearance, and named *plenissima;* and one in which the bracts are a soft rose, called *rosea-carminata.* All are winter bloomers. Mexico.

PROPAGATION.

By W. Watson.

PROPAGATION BY LEAVES.

UNDER certain conditions buds are formed on the leaves, the roots, or the flower-stems of a large number of plants; such buds being called adventitious, to distinguish them from the stem or normal buds, that are found present on all plants, and which are borne in the axils of the leaves. It is supposed that the leaves of a very large proportion of plants possess this power to develop extraordinary buds, and that their failing to do so when tested by the gardener is due to improper treatment rather than to absolute impotence in the leaf itself. It is, however, only in a few cases that leaf-cuttings are resorted to for purposes of propagation, such plants as Begonia, Gloxinia, Echeveria, and a few others, of more or less succulent nature, being the only ones for the increase of which leaf-cuttings are employed. Numerous other plants have proved capable of propagation by this means, some of them being not at all succulent-leaved, while, on the other hand, plants of excessive succulence have proved unable to form buds when tested in the same way. In some cases where leaf-cuttings have been tried, roots were freely developed, but no bud was formed. *Ficus elastica*, Camellias, and *Hoya carnosa* may be mentioned as plants whose leaves root freely but do not develop buds, although left in the propagating-house for several years. Lindley states that the leaves of Roses strike freely, but will not form buds, a peculiarity which, along with the above, is supposed to belong to the nature of species, and is not easily explained.

Where it is desirable that a new plant should be propagated as abundantly and rapidly as possible, it will be found often advantageous to place the leaves that are removed from stem-cuttings in the propagating-frame, and treat as advised below. That success might come when least expected may be seen by the following list, which comprises plants *capable* of propagation by leaf-cuttings. To any one acquainted with the nature of these plants, it will be apparent that no rule can be laid down for the guidance of the cultivator, either when based on the texture of the leaves or the nature of the plants.

List of plants that may be propagated by means of leaves or portions of leaves:—

Æschynanthus.
Begonia.
Bertolonia.
Bryophyllum.
Cardamine.
Cephaelis.
Citrus.
Clianthus.
Echeveria.
Fritillaria.
Fuchsia.
Gasteria.
Gesnera.
Gloxinia.
Haworthia.
Hippeastrum.
Hoya.
Hyacinthus.
Lilium.
Lithospermum.
Mentha.
Pachyphytum.
Pelargonium.
Phyllagathis.
Pinguicula.
Sempervivum.
Watercress.

In this list only those plants are included whose leaves have proved able to form buds capable of developing into plants, and it will be understood that a large number of plants might be added to the above if their leaves were tested. This method of propagation is only rarely resorted to; a fact which accounts for the smallness of the number of plants known to be amenable to it.

Turning now to the plants that are usually increased from cuttings made of leaves, a word may be said on the treatment such leaves require, and the best time of year for the operation. Gloxinias may be dealt with at all times of the year when leaves are obtainable, the most favourable period being autumn. Well-matured leaves should be selected, avoiding those in which the yellowness of decay has appeared. The leaf-stalk may be severed at any point, it being unnecessary to secure them with a heel or portion of the stem. The blade may then be divided longitudinally, so that a large leaf would form about half a dozen cuttings. It is, however, better when the blade is cut into sections, each section having a portion of the midrib attached to its base. Some prefer severing the midrib into about a dozen pieces, leaving the blade intact. In this way a plant is obtained from each portion of the midrib, bulbils being developed on the lower end of each. Where the latter plan is adopted the whole leaf must be pegged on to a pan of sandy soil. If the leaf is divided up into smaller pieces, cutting-pots may be used, filling the pots half full of drainage, and the other half with a light sandy soil. Into this the cuttings must be placed, obliquely, so that whilst held firmly in the soil their bases are only a little below the surface. A hot-bed or close frame in a propagating-house will be the most suitable place for the cuttings till rooted. In a small moist stove, a position on a shelf near the glass would answer equally well for Gloxinia cuttings.

Bertolonias may be increased from healthy ripened leaves, which, if the midrib be nicked in several places, and the whole leaf then pegged on to a pot of very sandy peat, soon form roots and tiny tubers at every incision, if placed in a moist propagating-frame. For these plants autumn is the most suitable season, the leaves at that time being more vigorous than at any other. *B. Van Houtteana* is easily increased from leaf-cuttings; *B. Marmorata* and one or two others sometimes produce good seed, from which abundance of plants may be obtained.

Gasterias, Haworthias, Echeverias, Sempervivums, and such-like succulents, are easily propagated from

leaves. The nature of these plants is such as to enable any portion of them to remain fresh and plump for a long time when placed under perfectly dry conditions; and such conditions are, as a rule, more favourable to the formation of roots, both by stem and leaf cuttings, than any other. All that is necessary, when a stock of these plants is wanted, is to strip the leaves from the lower part of the stem, placing them on a dry shelf for a few days, and then laying them on pans or boxes of dry sandy soil in a warm house. This treatment causes the leaves to develop roots, and afterwards buds, which soon start into growth, when water may be given them in the same quantities as required by larger plants.

Pinguicula caudata.—This handsome Butterwort is propagated either from seeds, seldom ripened in this country, or by means of its large tongue-shaped leaves; it does not develop lateral or basal buds in the same way as the British Butterworts are known to do. The leaves require to be prepared as advised for Bertolonias, but a pan of silver sand should be used instead of soil for them. They should be inserted with their bases just in the sand, and the blade resting upon it. Over the pan a pane of glass may be placed, the whole to be stood on a shelf near the glass, in a stove temperature. If the sand is moist when the cuttings are inserted, little or no water will be required by the cuttings till buds are developed. Begonias may be treated as suggested for Gloxinias; or if to be propagated on a large scale, a frame containing cocoa-nut fibre, heated to about 70°, may be used, pegging the Begonia-leaves on to the fibre. We may just refer here to the reproductive nature of some Fern-fronds, especially the Aspleniums, Nephrodiums, Aspidiums, and some Hymenophyllums, the fronds of which usually bear buds, which eventually form plants. The requirements of such leaves, when wanted for propagating purposes, are pretty much the same as those of the plants themselves.

Mention may also be made of the fleshy scales of some Cycads, of Marattias and Angiopteris, which have been employed as cuttings, owing to their power to root and produce plants. At Kew, both the Ferns here mentioned have been propagated in this way. The scales are large and succulent, and are borne on the stem about the bases of the leaf-stalks. When severed from the stem and placed in a propagating-frame, they first push forth roots, which are followed by the buds, generally a pair of buds to each scale, one on each side of the base.

The scales which form Lilium bulbs may, in like manner, be used for propagation, as if fresh when gathered, and placed in sandy soil in an intermediate temperature, they root and form small bulbs, capable of growing into large plants. All these exceptional ways of obtaining a stock of plants are only resorted to in rare cases; they are chiefly of physiological interest, showing, as they do, how nature has provided plants with auxiliary powers for their reproduction, which are held in reserve till called upon by the failure of the normal or proper means to fulfil the functions of increase or reproduction.

PROPAGATION BY ROOT-CUTTINGS.

The term root is sometimes applied to parts of a plant which are not strictly roots, although often produced in the same way and along with, or upon, true roots. Such portions are rhizomes, which are simply underground stems, as in Iris, Primrose, and Arum; corms, as in the Crocus and Cyclamen; and tubers, as in Caladium, Ginger, and Potato. These are all different forms of stem, as may be seen in their structure and appearance. We are incorrect in assuming that all subterranean portions of a plant belong to the roots. The proper function of roots is that of binding the plant to the earth, and absorbing nourishment for the stems and leaves; and, under normal conditions, they do not bear buds or any other organs. But although not naturally furnished with buds, many roots have the power to form them under certain circumstances, and, in a few cases, we may see them developing shoots habitually. Limes, Chestnuts, Poplars, Apples, and other trees may sometimes be seen surrounded by colonies of saplings, which owe their origin to this tendency on the part of roots to originate buds.

In consequence of this power in true roots, we often employ them for purposes of propagation, and, in the case of a few plants, root-cuttings are either the only or the readiest means of increase. As in the case of bud-generation in leaves, there appears to be no rule by which we can judge of the power of roots to form buds, but it is very likely that a great many more plants have this power than is generally believed. Where any difficulty occurs in the propagation of plants by the generally practised methods, it is always wise to try some of these out-of-the-way means, as by them a lucky hit is not unfrequently made. Take as instances of this the Droseras, *Arnebia echioides*, *Trichinium Manglesii*, and the Ipecacuanha plant which are but a few of those plants which are difficult of increase by any other method than that of root-cuttings. It is stated that the introduction of the valuable medicinal plant *Cephaelis Ipecacuanha* into India could not be successfully brought about till it was discovered that its roots, when cut up into small pieces, would produce plants. Nurserymen know the value of this method, especially when applied to herbaceous plants, whilst most gardeners are acquainted with its advantages

for the increase of Anemones, *Aralia Japonica*, *Pæonia Moutan*, &c.

As an illustration of how to proceed in the propagation of plants by root-cuttings, we may take *Anemone Japonica*, with the nature of which every gardener is familiar. "If a root of this kind be taken out of the ground after flowering, it will be found to resemble brown cord, divided into a great number of ramifications, as is represented in the accompanying wood-cut. Upon its surface will be perceived a multitude of white conical projections, sometimes growing singly, sometimes springing up in clusters, and occasionally producing scales upon their sides. They are young buds, every one of which, if cut from the parent, will grow, and form a young plant in a few weeks. These buds are not confined to the main trunk of the root, but extend even towards its extremities; so that every fragment of the plant is reproductive. It is certain that vitality is stronger in the roots than in any part of the plant." (Lindley.) *Paulownia imperialis* may be freely increased by cutting its fleshy roots into pieces about two inches long, and placing them in pans or boxes of sandy soil; the month of March is the most favourable time for striking cuttings of this plant, and, indeed, for the majority of plants to which this method is applied. The roots of Droseras are usually long and somewhat fleshy; these may be cut up into pieces an inch long, each one of which will produce a plant.

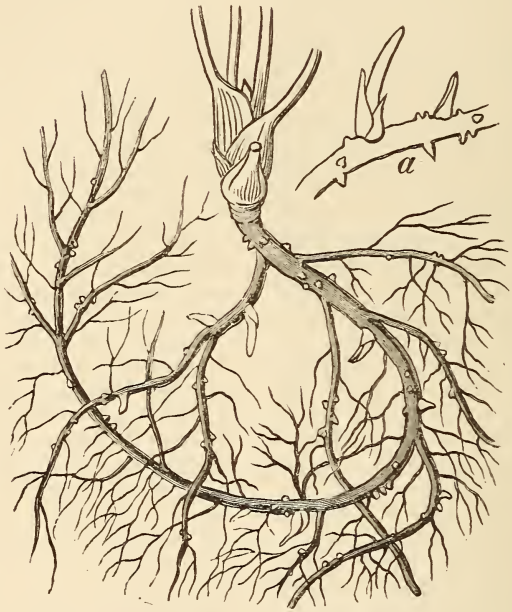


Fig. 17.—Root of Anemone Japonica.
a, Root-buds enlarged.

The treatment to be followed for the propagation of all plants where root-cuttings are used is as follows:—If possible, the whole plant should be removed from the ground, and, after washing the soil very carefully from the roots, the thickest and plumpest roots should be cut away, leaving sufficient roots on the plant to insure its re-establishment when re-planted. In the case of trees, the roots may be bared of soil, and cuttings selected. The cuts at both ends of each cutting should be clean, and it is necessary to avoid breaking the bark of the roots in manipulation. Stout roots, if plentiful, may be cut into lengths of about three inches, but, as a rule, lengths of one inch will answer as well as longer ones. Generally, each cutting produces only one bud, whatever its length, though in some cases—as, for instance, Drosera—several buds are sometimes developed on a single portion of root. In preparing cutting-pots, boxes, or pans for the reception of root-cuttings, the same rules may be followed as are observed in the case of stem-cuttings, care being taken that the soil is well drained and contains a large proportion of sand. If the cuttings be short they may be scattered over the surface of the soil, and covered with a thin layer of the same mixture, or of pure sand. Longer pieces may be dibbled in with their bases a little below the surface of the soil. A little bottom heat may be employed for cuttings of even hardy plants, the heat of a propagating-frame being advantageous to all tropical kinds. As a rule, the buds are developed on the outside of the root-cutting, exactly as adventitious buds appear on stem-cuttings. In *Maclura tinctoria* this rule is departed from, the shoots springing from between the wood and the bark of the root.

A remarkable case of bud-formation on roots is recorded in the *Gardeners' Chronicle*, vol. xxiii., p. 110. Mr. A. D. Webster, in a paper read before the Royal Horticultural Society, called attention to the extraordinary way in which a British Orchid, *Neottia Nidus-avis*, springs up in a single season where it was never seen in a young state; and on examining the root-stock, he found that the fleshy root-fibres, though dead at the base or end which had been attached to the old plant, were alive at the other end, and gradually developed young fibres. The extreme point of the root becomes a bud or shoot, from which a plant is ultimately developed. It is possible that the so-called roots on which buds are formed by this plant are not true roots, but under-

ground stems or stolons, analogous to what is seen in the reproductive character of the Strawberry. The same character is met with among Amaryllidaceous plants, Crinums and Agaves being the commonest examples. It is generally supposed that Cordylines (Dracænas) are propagated from root-cuttings, but the portions of the plants thus employed appear to be forms of the stem rather than true roots. It is, however, often difficult to discriminate between such parts and roots proper. In Burbidge's "Propagation and Improvement of Plants," it is stated that the thick roots of Platyceriums will develop plants if employed as cuttings. I am not aware of any Fern the roots of which would develop buds, nor does there appear to be any record of such having been seen except that here mentioned. The thick fleshy roots of Dahlias, Asparagus, Alstrœmerias, Bomarias, Dichorisandras, and some others are useless for purposes of propagation unless attached to portions of the stem; at least, I have never succeeded in getting plants from these tubers when entirely severed from the stem. Such organs appear to be meant to act as reservoirs, in which food is stored against unfavourable conditions.

In the subjoined list the names of those plants which may be increased from root-cuttings are given. Most of them have been successfully propagated in this way at Kew, and the whole of them may be considered well proved. It will be obvious, in what is above stated, that a great number of plants would probably prove capable of increase by means of root-cuttings, so that in any doubtful case it will be advisable to try the roots, especially of plants not readily propagated by any of the common methods.

List of plants which may be propagated from root-cuttings:—

Acacia grandis.
A. pubescens.
A. pulchella.
Acalyphas.
Anemone Japonica.
Apples.
Aralia Japonica.
A. cordata.
A. papyrifera.
Araucarias (?)
Aristolochia Goldieana.
Arnebia echioides.
Bouvardias.
Cephaelis Ipecacuanha.
Cephalotus follicularis.
Cherries.
Clematis.
Clerodendron fallax.
C. fragrans.
C. trichotomum.
Dais cotinifolia.
Droseras.
Greyia Sutherlandii.
Hellebores.
Jasminums.
Maclura tinctoria.
Melianthus.
Monsonia lobata.
Pæonia, herbaceous.
P. Moutan.
Panax plumatum.
Passifloras.
Paulownia imperialis.
Pears.
Pelargoniums.
Petræa volubilis.
Plums.
Pulsatilla bracteata.
Pyrus Japonica.
Roses.
Scolymus grandiflorus.
Senecio pulcher.
Stangeria paradoxa.
Trichinium Manglesii.
Xanthoceras orbifolia.

PROPAGATION BY EYES.

Eyes, or buds, are incipient branches, developed generally in the axils of leaves, and destined to continue the growth of the plant on which they are formed. There is no real difference between what we call a cutting and an eye, except that in the former a portion of the branch, and generally leaves, accompany the bud or buds. From this it will be apparent that eyes when favourably situated will reproduce the individual plant from which they have been severed, exactly in the same way as is done by cuttings. There seems, therefore, no reason why eyes should not prove equally advantageous with cuttings for the multiplication of plants; but with only few exceptions eyes are incapable of forming roots and becoming separate plants, and even these exceptions are not eyes simply, but have attached to them a portion of wood and bark, and sometimes a leaf also. Practically eyes alone are incapable of being turned to good account for propagating purposes, although the Vine may be said to be almost an exception. The supposed instance of natural reproduction by means of eyes which is said to be shown by some Liliums, on the stems of which buds are developed, and "separate spontaneously from their mother-stem, and falling to the ground, emit roots and become new plants," appears to us to be of a different nature from ordinary bud development. A Lilium stem does not form axillary buds similar to what are seen in a Dracæna stem, for if the top of the former be removed no lateral shoot is developed, as would take place in the latter case; on the contrary, the growth of the Lilium stem is stopped, and not unfrequently perishes. The bulbils formed in the axils of Lilium stems appear to be analogous to those produced by some Begonias and the flower-stems of Agave.

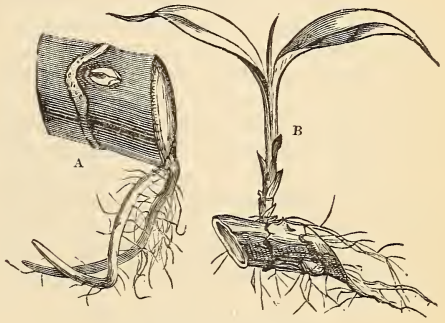


Fig. 18.—Rooted Eyes.
A, Rooted eye of Dieffenbachia; B, rooted eye of Cordyline (Dracæna), with young plant developed from eye.

Each eye must be accompanied by a portion of the stem, or a leaf, to enable it to form roots and grow. Eyes of Dracæna and of Dieffenbachia are here shown, and it will be apparent from them that

what we usually term "eyes," when speaking of propagation, are really stem-cuttings. These two stove-plants are generally increased from "eyes" made as here shown (Fig. 18). In every case where cuttings of portions of the branches are not available, and eyes only can be obtained for the propagation of the plant, it will be found advisable to sever a portion of the wood, however small, and if possible a leaf also, with each eye. This precaution will insure greater success than can be hoped for where it is neglected; by its means it becomes possible to employ eyes for the increase of numerous plants.

Perhaps the only plant for which eyes are most frequently employed for its propagation is the Vine, for detailed treatment of which see Vol. I., pages 230 and 231. Many plants, both out-door and in, may be increased in the same manner as Vines, but in almost every case a portion of the wood is attached to each eye, so that practically they may be called cuttings of a single eye. The importance of leaves both on these and on larger cuttings has already been commented upon. A leafless cutting is never so likely to succeed as one with leaves. Vines, and a few other plants, are perhaps exceptions, but no doubt the large quantity of organisable matter stored up in the ripened shoot of a Vine supplies the cuttings with that nourishment and vital force, which in many other plants is afforded almost wholly by the leaves.

ORCHIDS.

By William Hugh Gower.

Sarcanthus.—A small genus of mostly small-growing plants; they can scarcely be considered showy and effective, and yet there is a charm about them which is indescribable. The name comes from *sarx*, "flesh," and *anthus*, "a flower," in allusion to the extreme fleshiness of their flowers in proportion to their size. Some species of this genus are extremely slow in growth, but still profuse bloomers. They should be grown in small hanging baskets, and treated the same as *Aerides*, which see. East Indian House.

S. chrysomelas.—A more robust plant than the majority of the members of the genus; it is a handsome-growing and very ornamental species. The flowers are produced in profusion, but are small. Sepals and petals dull purple, inclining to black; lip somewhat triangular, yellow. Summer months. British Burmah.

S. erinaceus.—This is a small plant, and a very slow grower, introduced in some quantity about the year 1856, under the name of *Aerides rubrum*. Leaves two-ranked, oblong-acute, about three or four inches long, and dark green, the sheathing base freckled with reddish-brown. Peduncle pendulous, six to eight inches long, clothed with woolly hairs, rose-pink in colour. Racemes lax, bearing from ten to twenty flowers. Sepals and petals waxy-white, tinged with pink; lip rosy-red, column prolonged into a curious beak. Summer and autumn months. British Burmah.

S. Parishii.—Leaves lorate, obliquely two-lobed at the ends, about six inches long, dark green above, paler below. Racemes longer than the leaves, pendulous, many-flowered. Sepals and petals deep yellow, streaked with red; the lip rosy-pink. Summer and autumn months. British Burmah.

Schomburgkia.—This genus commemorates the celebrated explorer and collector, Sir Robert Schomburgk. These plants are nearly allied to *Epidendrum;* they are large and massive-growing plants, bearing their showy flowers upon long spikes. The treatment given for *Cattleya* will suit them admirably. Brazilian House.

S. crispa.—The members of this genus resemble Cattleyas in appearance. The pseudo-bulbs of this species are about a foot high, bearing a pair of dark green coriaceous leaves. Flower-spike terminal, about five feet long, bearing upon the summit a large raceme of yellow and brown flowers of great beauty. Winter months. Brazil.

S. Lyonsii.—This is a somewhat rare species; its pseudo-bulbs are a foot or more long, bearing a terminal spike some three feet high; upon the apex of this it bears a many-flowered raceme. Flowers white, spotted with yellow and purple. Autumn months. Jamaica.

S. tibicinis.—The pseudo-bulbs of this species are very large and stout, attaining a height of about two feet; these are ribbed and quite hollow, and from this it has been called the Cow-horn Orchid. There is a small hole at the base of each, and it is said these are always occupied by colonies of ants. Flower-spike five to nine feet long, bearing a very large raceme of flowers near the summit. Sepals and petals rosy-pink dotted and spotted with bright brown. Lip white, lateral lobes tinged with rose. Spring and early summer. Honduras.

Scuticaria.—From *scutica*, "a whip," in reference to the long whip-like terete leaves. Scuticarias, from their habit of hanging down, must be grown upon a block of wood, or in a shallow basket, with sphagnum moss and a little peat. They enjoy a copious supply of water in the summer months, and must never be allowed to shrivel, even in winter. As a genus it is closely allied to *Maxillaria*, its principal

point of distinction being the gland which bears its four pollen-masses. Warmest end of Brazilian House.

S. Steelii.—The whole plant is pendulous. Pseudo-bulbs very small and short, bearing a terete thong-like leaf, three to four feet long, and deep green. Scape short, springing from the base of the pseudo-bulb, one to two-flowered. Flowers thick and fleshy, very fragrant. Sepals and petals pale yellow, spotted and blotched with purple. The lip small, and somewhat deeper in colour. Autumn months. Demerara.

Sobralia.—This name commemorates the services to science of M. J. M. Sobral, a celebrated Spanish botanist. The plants belonging to this family are all terrestrial, with long reed-like stems in the place of pseudo-bulbs, bearing large strongly-ribbed or plicate leaves. The flowers are terminal, large and showy; they are, however, for the most part very fugacious, which has caused them to lose favour with many cultivators of this order of plants.

The species for which the genus was established (*S. dichotoma*), we are told, forms thick and almost impenetrable jungles or thickets in Peru, forming stout stems like Bamboo, and reaching a height of ten to twenty feet. If all attained such gigantic proportions, our modern Orchid-houses could not accommodate them. There are, however, numerous species of dwarf habit, for which it is easy to find space, and their large and brilliant-coloured flowers will amply repay for any attention bestowed upon them; for although the blooms of Sobralias are fugitive, there are several developed in each terminal spathe, and as soon as one fades another is at hand to take its place.

Sobralias make large masses of roots, and therefore require plenty of pot-room, and an abundance of water during the growing season; during the winter months less will be required, but it is not conducive to health to allow them to feel drought at any time. The pots must be drained well. For soil use loam, leaf-mould, and peat, in equal parts. Mexican division of Brazilian House.

S. Cattleya.—In stating that the stems are reed-like for this species, the same may be understood for all. Stems stouter than usual, leaves shining bright green. Flowers large and persistent, deep purplish-brown, with three yellow lines traversing the centre of the lip; the column white. Summer months. Columbia.

S. chlorantha.—Stems dwarf, leaves fleshy and not plaited. Flowers upwards of four inches in length, clear yellow. Summer months. Brazil.

S. chrysantha.—Leaves slightly fleshy. Flowers rich yellow. This is distinguished by having no appendage at its base, although it is crested along the centre. Summer months. New Grenada.

S. decora.—A small plant with smooth stems. Sepals and petals overlapping, white. Lip rose-colour. Various times during summer. Guatemala.

S. liliastrum.—Leaves lanceolate, light green. Flowers large, very fugacious, produced on many-flowered racemes. Sepals and petals rose-coloured, waved at the edges. Lip rich deep rose, crested with white. Summer months. Demerara.

S. liliastrum, var. *alba.*—Leaves scarcely so robust as in the species. Flowers pure white, the lip crested with yellow. Summer months. Demerara.

S. macrantha.—Stems about six feet high. Flowers large, upwards of six inches in length, rich purple, and very fragrant. It continues to flower throughout the summer months.

S. macrantha, var. *nana.*—This is usually called "Wolley's variety," as it appears he was the first to obtain it. The stems seldom exceed three feet in height, and therefore it is easily accommodated. Flowers large, six to eight inches in length, rich deep purple and crimson. Summer months. Guatemala.

S. macrantha, var. *pallida.*—About the same height as the species. Flowers large and very fragrant, six to seven inches long. Sepals and petals delicate pale rose; lip white. Summer months. Guatemala.

S. Ruckerii.—A dwarf species, which produces its flowers in racemes, several being open at the same time, and they are very persistent. Flowers large and somewhat fleshy. Sepals and petals beautiful dark rose. Lip large and spreading in front, rich crimson, white on the disc, and three-ribbed, but destitute of any protuberance at the base. It blooms throughout the summer months. New Grenada.

S. sessilis.—This is a dwarf plant, somewhat in the way of *S. decora*, but differs from it in having its stems clothed with short black hairs, and in its flowers being destitute of a foot-stalk (sessile). Flowers, in the sepals and petals, rich rose-colour, lip white, stained with yellow at the base. Autumn months. Demerara.

S. violacea.—A dwarf species, with imbricating leafy bracts. Flowers large, light violet in the sepals and petals. Lip deeper-coloured. In the variety *luteo-alba* the flowers are pure white, with a stain of yellow on the lip. Summer months. New Grenada.

Sophronitis.—A genus of small compact-growing epiphytes, with, for the most part, large and showy flowers, and as these are produced during the winter months they are very highly appreciated. The name comes from *sophrona*, "modest," which was applicable to the first species discovered (*S. cernua*),

but the large and brilliantly coloured flowers of some of the later discoveries are the most conspicuous objects in the plant-house. Sophronitis should be planted in equal parts of peat and sphagnum moss, and suspended in an earthenware basket. They enjoy a liberal supply of water all the year round. Peruvian House.

S. cernua.—This plant is dwarf, bearing a single oblong-oval leaf, and a few-flowered raceme of small flowers, which are red, with a yellow lip. Winter months. Neighbourhood of Rio Janeiro.

S. grandiflora.—A superb plant, which seldom exceeds six inches in height; pseudo-bulbs tufted, short, and bearing a single oblong leaf. Peduncles long and slender, bearing a large solitary flower, upwards of three inches across in good varieties. Sepals and petals thick and fleshy, the latter very much the larger, all of a uniform rich scarlet or crimson. Lip yellow, the narrow-pointed front lobe scarlet. In the variety *coccinea* the pseudo-bulbs are more oblong, and the flowers intense scarlet. In var. *rosea* the pseudo-bulbs are very short and obtuse, and the whole flower, including the lip, is a delicate soft rose. It blooms throughout the winter months. It is found on trees on the mountains, where rime frost is seen in the morning, near Rio, and in different parts of Brazil.

Sophronitis Grandiflora.

S. violacea. — Pseudo-bulbs small and slender, bearing a long, narrow, sharp-pointed leaf. Flowers small but very pretty, delicate soft violet in colour. Winter months. Organ Mountains, Brazil.

Stanhopea.—A large genus of handsome-flowered epiphytes, named in honour of Earl Stanhope. They are robust-growing plants, with stout and large ribbed pseudo-bulbs, which bear a single large, dark green, plaited leaf, thick and coriaceous in texture, and very persistent. The flower-spike springs from the base of the pseudo-bulb, and grows straight downwards, and bears a number of large flowers of a most extraordinary shape, nearly all the species being more or less powerfully fragrant. The flowers, however, are somewhat short-lived. The extraordinary shape of the flowers necessitates fresh definitions for the peculiarly formed lip, which is divided into three parts—the hypochil or lower cavity, the mesochil or middle part, from which the horns proceed, and the epichil or front movable lobe.

Stanhopeas should be grown in hanging baskets, with the bottom full of large perforations, in order to allow the flower-spikes to get down; planted in peat and sphagnum, and allowed to become thoroughly root-bound, as in this state they flower far more freely. An abundant supply of water is necessary during the growing season, but not a drop should be given during the winter, unless they show signs of exhaustion. Brazilian House when growing; when at rest, Peruvian House.

S. Bucephalus. — Raceme three to six-flowered. Flowers very large, and rich tawny-orange, profusely spotted with blood-red; powerfully aromatic. Summer and early autumn. The mountains of Ecuador, at 6,000 feet elevation.

S. guttulata. — Flowers large, ground-colour a pale nankeen, very thickly spotted and dotted with purple. Lip with a narrow truncate hypochil, mesochil somewhat ovate, nearly flat, bearing three small teeth. It is a beautiful flower, somewhat resembling *S. oculata*, but destitute of the eye-like spots. Summer and early autumn months. Brazil.

S. insignis. — Raceme three to seven-flowered. Flowers large and fragrant. Sepals and petals a pale creamy-yellow, profusely and regularly spotted with reddish-purple. Lip white, and dotted with purple, the hypochil bearing a pair of large violet-purple spots. Early autumn months. Brazil.

S. Martiana.— Raceme about three-flowered, and these are very large and massive. Sepals and petals not reflexed as in most of the species; the

sepals very broad, thick and waxy, yellowish-white, spotted and dotted with red; petals much narrower, blotched and spotted with chocolate. Lip white, dotted all over with red, and stained at the base with a large blotch of reddish-brown. Early autumn months. Mexico.

S. oculata.—This species derives its name from the peculiar eye-like spots on the side of the hypochil, which are sometimes represented by one pair, at others two pairs. Racemes bearing numerous large flowers. Sepals pale yellow, profusely spotted with lilac or purple; petals much narrower, sparingly marked with a few large spots. Flowers very aromatic, with a smooth and shining surface. Autumn months. Mexico.

S. ornatissima.—Raceme three to five-flowered. Flowers large and fragrant. Sepals and petals very deep orange, spotted all over with dull red, and stained at the base with a large blotch of reddish-purple. Lip white, dotted all over with rose, and bearing on the hypochil a pair of eye-like purplish spots. Autumn months. Mexico.

S. radiosa.—Raceme three to five-flowered. Dorsal sepals and petals white, tinged with straw-colour, dotted all over with pink lateral sepals white, tinged with straw-colour, and, like the petals, stained towards the base with tawny-orange. The lip pale yellow, dotted with pink, the hypochil tawny-orange. Autumn months. Mexico.

S. tigrina.—This species produces the largest flowers in the whole genus, often measuring eight inches across. Sepals and petals very thick and waxy, the ground-colour a rich yellow, irregularly blotched and striped with rich brown. Lip tawny-yellow, dotted with reddish-brown. It yields a very strong odour, somewhat between vanilla and melon, and very aromatic. Summer months. Mexico.

S. tricornis.—Flowers some six inches across, very fragrant, ground-colour pale clear yellow; petals and lip almost deep yellow; the hypochil bearing a pair of deep orange eye-like spots, the mesochil having an additional short horn-like process. Autumn months. On the Mountain of Chimborazo, Peru.

S. Wardiana.—This is a very fine species, and an abundant bloomer. Raceme three to six-flowered or more. Ground colour deep rich golden-orange, much spotted with reddish-orange. The hypochil ornamented with a large blotch of dark velvety-purple. The flowers are very fragrant. Summer and early autumn. Guatemala.

Stenorhynchus.—A small genus of terrestrial Orchids, containing very few showy-flowered species. The name is derived from its narrow column: *stenos*, "narrow," and *rhynchus*, "a beak." The various members of this family are all natives of South America and the islands of the West Indies. For soil use two parts of loam to one of peat, and do not elevate the plant above the rim of the pot. Supply freely with water until growth is mature, when very little will suffice until fresh growth commences. Brazilian House.

S. speciosus.—Leaves broadly-oblong, waved at the edges, dark green. Scape erect, longer than the leaves, bearing large scarlet bracts, longer than the flowers. Raceme dense and many-flowered. Outer portion of flower scarlet; petals and lip white. Its brilliantly coloured flowers and bracts render it very conspicuous. Spring and summer months. West Indian Islands.

Thunia.—A small genus of terrestrial plants, which have been separated from *Phajus*. They have long terete, stem-like, deciduous pseudo-bulbs, and terminal clusters of flowers. Pot-culture suits them best. Plant them in rough peat, sphagnum moss, and well-decomposed cow-manure. During the growing season these plants require an abundance of water. After the flowering is over the leaves will soon begin to fall, and very little water will be sufficient to keep life in them until growth commences again. East Indian House.

T. alba.—Stems erect, two to three feet high, clothed with glaucous, lanceolate, stem-clasping leaves. Flowers in short, dense, terminal racemes. Sepals and petals linear-lanceolate, longer than the lip, pure white. Lip white, streaked with purple and lilac. Summer months. Northern India.

T. Bensoniæ.—Similar in habit to the preceding; leaves sheathing at the base, about ten inches long, linear-lanceolate, bright green above, paler below. Flowers large, some three inches long, in dense terminal racemes. Sepals and petals linear-lanceolate, deep reddish-purple on the outside, paler towards the centre. Lip three-lobed, rolled over the column at the base, where it is white, spreading in front, where it is rich deep purple, frilled on the edge, and bearing several yellow-crested ridges on the disc. Summer months. British Burmah.

Trichocentrum.—From *thrix*, "a hair," and *centron*, "a spur," in reference to the spur at the base of the column. A small genus of dwarf tufted epiphytes, only two species of which are worth growing for their beauty. They should be grown upon a block of wood, or in small earthenware baskets, and kept moderately well supplied with water all the season. Brazilian House.

T. albo-purpureum.—Pseudo-bulbs ovate, bearing oblong-lanceolate, coriaceous, bright green leaves. Peduncle pendulous, one-flowered; flowers about two inches across. Sepals and petals brown, tipped

with yellowish-green. Lip white, with two large purple spots at the base. It blooms at various seasons. Rio Negro, Brazil.

T. tigrinum.—This is a very handsome species, with more the appearance of a *Miltonia* than a member of this genus. The flowers are large; sepals and petals yellow, profusely spotted with rich purple-maroon. Lip very large, cuneiform, white, the disc yellow, and the base a deep rich violet. It blooms at various seasons. Ecuador.

Trichopilia.—A small family of epiphytes, deriving their name from the peculiar column, which has upon its summit three tufts of hairs or plumes, which form a hood and cover the anther—thus, *thrix*, "a hair," and *pilon*, "a cap." Trichopilias are all dwarf compact plants, producing showy flowers, and are nearly allied to *Maxillaria*. Pot-culture suits these plants best, although they thrive well in baskets. Plant them in a mixture of peat and sphagnum moss, adding a few nodules of charcoal and a little sharp sand, and keep the plants well elevated above the rim. These plants do not require a large water supply to their roots at any time, although even in the winter they should never be allowed to feel the effect of drought; but they give proof by the way they grow that they enjoy an atmosphere well charged with moisture. Brazilian House.

T. coccinea.—Pseudo-bulbs tufted, oblong, bearing a single lanceolate-acute, leathery, dark green leaf. Peduncle, from the base of the pseudo-bulb, pendulous, one to three-flowered. Flowers variable in colour. Sepals and petals linear-lanceolate, very slightly twisted, reddish-brown, with a narrow marginal border of yellowish-white. Lip rolled over the column with a spreading front limb, white outside, deep red within, the margin bordered with white. Spring and early summer. New Grenada.

T. crispa.—This plant we are told grows naturally "upon the branches of trees overhanging streams of water," thus showing it enjoys the moisture which rises into the atmosphere. It is a robust-growing species, producing two crops of flowers in one season. Raceme pendulous, one to three-flowered. Sepals and petals reddish-crimson, narrowly edged with white. Lip trumpet-shaped, deeper colour than the petals, with a narrow white border. Spring months. Costa Rica.

T. crispa, var. *marginata.*—This form still remains extremely rare; it is similar in habit to the preceding, perhaps more robust, as it attains a height of about twelve inches. Racemes one to three-flowered. The blooms are larger than the species, bright crimson, with a distinct white border to all the parts. Summer months. Central America.

T. Galeottiana.—Pseudo-bulbs stem-like and pale green, bearing a single dark green leaf. Raceme pendulous. Sepals and petals not twisted, white. Lip light pink, and suffused with pale yellow. Spring and summer months. Mexico, at 3,000 feet elevation.

T. hymenantha.—Pseudo-bulbs clustered, very small, bearing a single narrowly-lanceolate leaf, thick and fleshy in texture, about six inches long, and deep green. Racemes pendulous, about six-flowered; sepals and petals white. Lip spreading, not rolled over the column, toothed at the edge, with a little point in front, white, prettily dotted and spotted with bright red. Spring and summer months. New Grenada.

T. suavis.—Pseudo-bulbs large and ovate, with compressed edges. Leaves solitary, broadly-obtuse, and deep green, the whole plant usually about a foot high. Raceme pendulous, two to three-flowered; these are very large, and deliciously fragrant. Sepals and petals pure white. Lip trumpet-shaped, the base rolled over the column, the front spreading and waved at the edges, white, blotched and spotted with rosy-pink. Spring months. Costa Rica, at 5,000 to 9,000 feet elevation.

T. suavis, var. *splendens.*—Peduncle five to six-flowered. Sepals and petals white. Lip very large, upwards of three inches across, white profusely blotched with rosy-pink and crimson, streaked and spotted with spots and streaks of rich deep orange. Spring months. Costa Rica.

T. tortilis.—A free-growing plant, with oblong pseudo-bulbs and an acuminate leaf. Sepals and petals long and narrow, brown, bordered with yellowish-white, and twisted in a spiral manner. Lip trumpet-shaped, white, dotted and spotted with red. Spring months. Mexico.

Uropedium.—The name comes from *ouro*, "a tail," and *podion*, "a foot," in reference to the tail-like appendages of sepals, petals, and labellum. In habit and appearance the only known species resembles *Cypripedium caudatum*, and the treatment it requires is the same as already given for that species. Brazilian House when growing: when at rest, Peruvian House.

U. Lindenii.—A plant quite destitute of pseudo-bulbs, and very nearly allied to *Cypripedium*, one species, *C. caudatum*, being so like it when not in flower that it is difficult to distinguish them. Leaves distichous lorate, about a foot long, oblique at the extremity, and bright green. Peduncle one to two-flowered, erect. Sepals broad and long, somewhat undulate at the edges, yellowish, streaked with dark green and orange. Petals lengthened, with tail-like appendages, oftentimes two feet in length, purplish-

orange at the base, tails brown. Lip flat and broad, lengthened out into a tail like the petals, reddish-brown. Summer months. New Grenada, at 8,500 feet elevation.

Vanda.—This is perhaps the most stately genus to be found in the whole order, for the majority of the species are very ornamental, even when not in flower. They are all natives of India and the Indian Islands, and have been allowed to retain their Hindoo name, which is, however, more properly applied to parasites than epiphytes. Vandas require for the most part strong heat, and an atmosphere well charged with moisture, especially during the growing season; and although we read of the severe drought which some species have to suffer naturally, it must not be attempted under artificial treatment, or the specimens will be much disfigured and reduced in value; therefore, water carefully during winter, giving just sufficient to maintain the leaves in a plump condition without exciting them to grow. General treatment same as for *Aerides*, which see. East Indian House.

V. Batemanii.—Stems erect, leaves arranged in a distichous manner, which relates to all the species, and need not be repeated. Leaves thin and coriaceous, standing out straight and stiff. Raceme bearing from ten to twenty large, thick, and fleshy spreading flowers. Sepals and petals nearly equal, golden-yellow, spotted all over with crimson, purplish crimson behind. Lip crimson. Summer months. Near the sea, Philippine Islands.

V. Bensoni.— A small-growing species; leaves about six inches long, oblique at the apex. Spike a foot or more long. Raceme ten to fifteen-flowered, flowers about two inches diameter. Sepals and petals white behind, green in front, dotted all over with reddish-brown. Lip three-lobed, side lobes small, white, front lobe bifid, soft violet. Summer months. Rangoon.

V. Cathcarti.—A distinct and handsome species, having much the habit and appearance of a *Renanthera*. Leaves linear-oblong, falcate, some eight inches long, bi-lobed, and the summit pale green. Racemes pendulous, flowers about two inches and a half across. Sepals and petals broad, nearly equal, concave, pale yellow, very thickly streaked with transverse lines of chocolate-brown. Lip three-lobed, side lobes small, white, sparingly streaked with brown at the base; front lobe reniform, with a white margin and a swollen centre, which is yellow, with a crenate border. Spring and summer months. It is found in hot shady valleys, in the neighbourhood of water. Eastern Himalayas.

V. cærulea.—This lovely species requires less heat than the majority of this family. Leaves equally truncate. Spike twelve to eighteen inches long, bearing ten to twenty flowers, which are upwards of four inches across. Sepals and petals oblong-obtuse, the latter smaller, and twisted at the base, all soft pale blue, tessellated with a deeper shade of the same colour. Lip small, linear-oblong, deep violet. Winter and spring months. Northern India.

V. cærulescens.—A small-growing species, with leaves about six inches long; these are about an inch broad, coriaceous in texture, keeled beneath, deep green. Scape erect; raceme ten to twenty-flowered, each flower upwards of an inch across. Sepals and petals nearly equal, somewhat spathulate, soft lilac in front, darker behind. Lip smaller than the petals, front lobe flat, and dark blue. In the variety *Boxallii* the sepals and petals are nearly white, and the lip has a white marginal border. Spring months. British Burmah, at about 1,500 feet elevation.

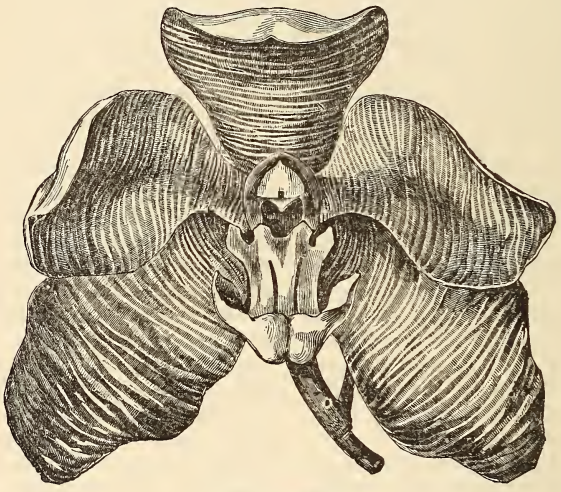
V. cristata.—A small-growing plant with less beauty than most of the species. Leaves channelled, truncate at the apex, four to six inches long, and deep green. Raceme three to six-flowered. Sepals and petals greenish-yellow. The lip three-lobed, side-lobes small and incurved, middle lobe broad and flat, unequally three-horned in front, ground-colour yellow, striped longitudinally with raised lines or crests of reddish-purple, in some varieties approaching black. Spring and early summer. Nepaul.

V. Denisoniana. — This species undoubtedly is nearly allied to *V. Bensoni*, which it resembles in growth. Professor Reichenbach alludes to the recurved lobes of the labellum, which he says is a point of distinction, and which he likens to the tail of a blackcock; but we find the same feature in *V. Bensoni*. It is the first species of this genus with white flowers ever discovered. Racemes five to ten-flowered, each flower two inches across, and pure white. Sepals and petals somewhat spathulate. Lip broad, the disc bearing fine elevated lines, the front lobe recurved on each side. Spring and early summer. Aracan Mountains.

V. gigantea.—This species is very massive, indeed it bears the same relation to the other Vandas as *Agave Americana* does to the smaller-growing members of its family. Leaves broadly strap-shaped, eighteen inches or more long, very thick and fleshy, dark green. Raceme pendulous, from the weight of its fleshy blooms, bearing ten to fifteen flowers, each three inches across. Sepals and petals nearly equal, oblong-obtuse, inclining to spathulate, rich deep yellow, spotted and blotched with dark brown. Lip small, white, faintly tinged with purple on the side lobes. Spring and early summer. British Burmah.

V. Goweræ.—This is a slender species, resembling a Camarotis in habit of growth, and the flowers are like those of *Cœlogyne cristata* in miniature; it is a cool-house plant, as in its native habitats it often has snow lie upon it during the resting season. Raceme erect, simple or branched, according to the strength of the plant, five to ten-flowered, flowers about two inches across. Sepals and petals much waved at the edges and pure white. Lip white, tinged with yellow in front, with a little green at the base. Summer months. Northern India.

V. insignis.—A plant under this name has been in English gardens for many years with a doubtful reputation. Blume many years ago gave the name to a Vanda, but every one failed to distinguish the plant named *insignis* in cultivation from *V. tricolor*, saving in colour. In 1867 Hutton sent home from the Indian Archipelago some Vandas, which turned out to be Blume's plant, and confirmed the impression amongst cultivators that the *insignis* of gardens was only a form of *V. tricolor*. The plant in question is very handsome. Leaves about ten inches long, linear, with the ends truncate, deep green. Raceme bearing six to eight or more flowers, which are spreading, and upwards of two and a half inches across. Sepals and petals somewhat spathulate, the latter being rather smaller, yellowish-white behind, deep brown in front, spotted with reddish-brown. Lip panduriform, inclining to spathulate, three-lobed, the small lateral lobes white, the large centre one purplish-rose. Spring and early summer. Island of Timor.



Vanda Cathcarti.

V. insignis, var. *Schroederiana.*—A beautiful addition to this splendid family of plants. There can be little doubt of its being merely a variety of the preceding species, as in everything but colour the flowers are identical. Sepals and petals rich canary-yellow. Lip large, pure white. Autumn months. Island of Timor.

V. limbata. — This species ranks among the smaller-growing kinds, and undoubtedly is a near ally of *V. furva*, which was at one time held in esteem, but has lost caste since the introduction of more beautiful forms. Leaves about six inches long, and an inch and a half broad, bi-lobed at the apex, and deep green. Racemes erect, bearing ten to fifteen very showy flowers, about two inches across. Sepals and petals equal, spathulate, bright chestnut-brown, marbled with a deeper hue of the same colour, bordered with a rich yellow, and tinged with lilac outside. Lip spreading, rosy-lilac. Summer months. Java.

V. Roxburghii.—A handsome small-growing species with recurved, coriaceous, strap-shaped leaves, which are keeled below and truncate at the apex. Raceme many-flowered. Sepals and petals oblong, china-white, tessellated with purple. Lip deep red. In the variety *cærulea* the flowers are the same except the lip, which is of a beautiful bright blue. Summer months. Northern India.

V. suavis.—Leaves lorate, recurved, and deep bright green. Racemes erect, bearing from seven to fourteen of its exquisite fragrant flowers. Sepals and petals somewhat spathulate, erect, flat when first open, ultimately twisted, china-white, plain behind, but beautifully spotted and blotched in front with purple and crimson. Lip three-lobed, deep violet. Summer months. Java.

V. teres.—Leaves terete, about as thick as a turkey's quill, and deep green. The flower-spike arises from the opposite side of the stem to the leaf, and is ascending, bearing a raceme of about seven flowers, which are upwards of four inches across. Sepals and petals oblong-obtuse, petals much the broader, soft rose-colour, with a paler border. Lip large, three-lobed, side lobes rolled over the column, middle lobe flat and spreading; disc yellow, veined with reddish-crimson, the margin rosy-purple. In the variety *Andersonii* the flowers are somewhat more brilliant in colour, and very freely produced. Spring and summer months. Northern India.

V. tricolor.—This is at once a most beautiful and a most variable plant, in respect to the colour and markings of its flowers; some of the most distinct

have been named and recorded, the best of which are *aurea*, *Dodgsonii*, *formosa*, *insignis*, *Patersonii*, *planilabris*, *Schilleriana*, *Russelliana*, *Warnerii*.

It is similar in habit to *V. suavis*. Racemes six to twelve-flowered. Sepals and petals pale yellow, or yellowish-white, blotched and spotted with crimson. Lip purple, streaked with white. Spring and summer. Java.

Vanilla.—A small genus of climbing Orchids, deriving their name from the Spanish word *vaina*, "a sheath," in reference to the shape of the seed-vessel. These plants emit roots from the joints and attach themselves to trees much in the same manner as Ivy, and thus climb to the tops of the forest trees. The seed-pods of *V. aromatica* are largely used for flavouring ices and jellies, liqueurs, and for other domestic purposes; they are also used to perfume snuff, &c.; but very few species are deserving notice from the horticultural point of view. The situation best adapted for Vanillas is a wall in a warm house, where they can be allowed to have a full amount of sunshine. Pot in peat and sphagnum moss, and drain well. Supply abundantly with water during the summer, and never allow them to suffer drought, though only just sufficient is requisite during winter to keep the stems and leaves from shrivelling. East Indian House.

Warrea Candida (*enlarged*).

V. aromatica.—This species is more remarkable for its economic properties than for the beauty of its flower, although the best Vanilla of commerce is the produce of *V. planifolia*. It grows and fruits freely in this country. Stems terete, fleshy, and deep green, bearing alternate, oblong, succulent, dark green leaves. Flowers thick and fleshy, in short racemes. Sepals and petals oblong-acute, nearly equal, spreading, greenish-white. Lip entire, and bearded at the base, leaving the column naked. Seed-pod cylindrical and fleshy, full of small black seeds, which yield a grateful perfume. Brazil.

V. lutescens.—This species is an exception to the majority of the members of the genus, whose flowers are usually dull-coloured and inconspicuous. It is somewhat rare, but sufficiently showy to induce the lovers of this order to find a place for it, as the racemes bear six to twelve flowers, each measuring about six inches in diameter, of a uniform rich golden-yellow. Summer months. French Guiana.

V. Phalænopsis.—A large-flowered and handsome species, at present rare in cultivation. Flowers produced in umbels of from three to seven, each some two to three inches across. Sepals and petals pure white, green at the back. Lip large, soft rose, inside rich velvety-orange. Madagascar.

Warrea.—A genus named in honour of Mr. F. Warre, a collector of plants in Brazil; they are for the most part very showy and handsome, but have very little to distinguish them from *Huntleya*. These plants have small, or no pseudo-bulbs, consequently must not be subjected to a drying-off. Plant them in peat and sphagnum, with a few nodules of charcoal, drain the pots well, and water freely when growing. Brazilian House.

W. bidentata.—Leaves strongly veined or plaited, deep green. Flowers solitary, large. Sepals and petals soft cream-colour. Lip bidentate at top, with a curious elevated lamella, rich deep purple. Spring months. Peak of Tolima, New Grenada, at 4,000 feet elevation.

W. candida.—These plants are all similar in growth; it attains a height of about ten inches. Peduncle two or three-flowered. Sepals and petals oblong-acute, pure white. Lip broad, purple in the centre, shading into blue at the margin, whilst the base is white, with a few streaks of red. It blooms at various seasons. Bahia.

W. cyanea.—Although introduced over forty years ago this is still a rare plant, which is much to be regretted, as it is one of the few Orchids with a bit

of pure blue in it. Sepals and petals pure white. Lip roundish-apiculate, deep blue. Summer months. Columbia.

W. discolor.—Leaves narrower than is usual in these plants. Peduncle supporting a solitary flower. Sepals and petals white, tinged with purple, the latter being broader. Lip convolute, deep purple on the disc, passing into white on the margin, raised crest at the base white. Spring months. Central America.

W. quadrata.—Peduncle one-flowered. Sepals oblong-ovate, pale yellow, tipped with green; petals same size, clear yellow. Lip rolled over the column, spreading in front, purple in the centre, toothed at the base, where it is tinged with violet. Summer months. Ocana.

W. Wailesiana.—This species is one-flowered, with the fragrance of the Sweet Pea. Sepals and petals cream-colour. Lip roundish in front, somewhat wedge-shaped at the base, delicate violet along the centre; the crest at the base consists of fine violet longitudinal tubercles, which are only attached at the base. Spring months. Brazil.

Warscewiczella.—A small genus named in honour of M. Warscewicz, a celebrated botanical collector; they are very nearly allied to *Warrea*, and require the same treatment. Brazilian House.

W. marginata.—This is a handsome plant, quite destitute of pseudo-bulbs, but producing broad, strongly-ribbed leaves, which imbricate at the base. Peduncle one-flowered, shorter than the leaves. Sepals and petals all turned back, pure white, tinged with straw-colour in some varieties. Lip large, spread wide open, rolled over the column at the base, pale yellow, with an uninterrupted broad marginal border of rich crimson. It blooms at various seasons. New Grenada.

Zygopetalum.—A somewhat extensive family, containing numerous very handsome species. The name is derived from *zygos*, "a yoke," and *petalon*, and refers to the peculiar joining together of the sepals and petals at the base.

These plants should be potted in rough peat and sphagnum moss: they should be thoroughly well drained, as they enjoy an abundant supply of water during the growing season; when this is completed very little will suffice, as their large and stout pseudo-bulbs enable them to withstand drought with impunity. Brazilian House.

Z. aromaticum.—This species is less robust than the others; the flowers measure about four inches across. Sepals and petals oblong-acute, the former the larger, pale green. Lip large and flat, cordate in front, crenate on the edge, centre deep blue, with a broad white margin, crested at the base. Winter months. Central America.

Z. Mackaii.—pseudo-bulbs large and ovate, bearing numerous long strap-shaped leaves, which are strongly ribbed and deep green. Scape erect and many-flowered. Sepals and petals green, transversely barred with brown. Lip large and spreading, lilac, streaked and netted with lines of blue. The variety *crinitum* is a dwarfer plant, with flowers equally large, but slightly paler, and fringed with numerous black tubercles. Autumn and winter months, lasting long in full beauty. Brazil.

Z. maxillare.—This species thrives admirably on the stem of a Tree Fern, and when thus treated displays its beauty to the greatest advantage. Stem ascending; the pseudo-bulbs are somewhat small, indeed the whole plant is dwarf. Sepals and petals yellowish-green, and stained with brown towards the base. Lip thick and fleshy, deep rich blue. Winter and spring months. Brazil.

Z. rostratum.—Whole plant dwarf, flower large. Sepals and petals yellowish-green. Lip large and spreading, upwards of two inches across, white, streaked and lined with rosy-pink. Autumn and spring months. Demerara.

TREES AND SHRUBS.

By George Nicholson.

Clethra — the Sweet Pepper-bush, or White Alder of the North-eastern United States—is represented in British gardens by a couple of handsome, hardy, deciduous species. *C. alnifolia* has upright panicled racemes of handsome fragrant white flowers; it forms a shrub three to ten feet high. *C. acuminata* has solitary drooping racemes, and is a taller plant, sometimes attaining tree stature. Both like a damp spot in peaty soil.

Colutea arborescens—the Bladder Senna of Southern Europe, &c.—is a deciduous shrub, with pinnate leaves and yellow Pea-shaped flowers, followed by large bladder-like pods. *C. cruenta* is a similar plant, with reddish-tinted flowers. Both are quick-growing, and succeed well in dry gravelly spots, or on banks where few other shrubs would thrive.

Cornus.—There are about twenty-five species of the genus *Cornus*, all natives of north temperate and sub-tropical regions. *C. florida*, one of the North American species, is very beautiful when in flower, by reason of the very large pure white bracts. *C. mas*, the Cornelian Cherry, has small clustered yellow flowers, which open from February to April,

succeeded by beautiful Cherry-like fruits; it is a native of Europe. A garden form, with silvery-variegated leaves, *variegata*, and another, marked with creamy-white, and tinged with red, *elegantissima*, are two excellent foliage shrubs. *C. stolonifera* has the annual shoots of a bright red purple colour, which renders the leafless plant a conspicuous object in the shrubbery during the winter months. All the Cornuses may be propagated from seed, or by layering, and the variegated ones may be grafted on the stronger-growing green-leaved species.

Cotoneaster.—Of this genus of *Rosaceæ* about fifteen well-marked species are known, and these are natives of Europe, North Africa, temperate Asia, and Mexico. A considerable number of forms exist of some of these. *C. vulgaris*, *frigida*, and *Simonsii* are the best of the deciduous species; and *buxifolia*, *microphylla*, and *thymifolia* of the evergreen ones. *C. vulgaris* is interesting on account of its being one of the rarest of our native plants, as it is confined to limestone cliffs on the Great Orme's Head, but it is common on the Continent; it has round, shortly-stalked leaves, and shining globose red fruit. *C. frigida*, a Himalayan species, is a robust-growing tree, with large cymose clusters of scarlet fruits; in winter this is one of the most beautiful of berry-bearing shrubs or trees. *C. Simonsii*, the origin of which is not known with any degree of certainty, is believed to be also Himalayan. It has glossy dark green pointed leaves, about an inch long, and scarlet top-shaped fruits, borne singly, or in pairs, from the axils of the leaves of the short-jointed lateral branches. *C. buxifolia* has Box-like leaves, dark green, glossy above and woolly beneath. It does well treated as an ordinary shrub; if allowed to develop at will, when planted in masses, it soon forms an almost impenetrable thicket. *C. microphylla* is valuable for covering walls, banks, &c.; it has crowded, small, oblong, dark green shining leaves, and dull red, roundish or top-shaped fruit. *C. thymifolia* is a pretty, small-growing, prostrate creeper, with narrower, dull (not glossy) pale green leaves. This, and the two preceding species, are Himalayan.

Cratægus.—The common Hawthorn, or May (*C. Oxyacantha*), furnishes an excellent example of the genus *Cratægus*, of which there are about fifty species, most being hardy flowering trees or shrubs of considerable beauty, both in flower and fruit. The varieties of our native Whitethorn are very numerous, and include single and double white, pink, and scarlet flowers; in habit, too, there are widely-differing forms—viz., *tortuosa*, with twisted, erect branches; *pendula*, with weeping ones, &c. *C. coccinea*, the Scarlet-fruited Thorn of the Northern United States, is a quick small tree, extremely ornamental, either when covered with its corymbs of large white flowers, or laden with the large bright red fruits. *C. cordata*, or the Washington Thorn, is a neat-growing, small tree, with glossy-stalked leaves and many-flowered corymbs; this is interesting as being the last of all the cultivated Thorns to flower; it lasts nearly to the end of July. *C. Crus-galli*, the Cockspur Thorn, is another North American species, with glossy leaves, handsome fruits, and formidable curved spines; there are numerous forms, varying in the shape of the leaf, &c. *C. melanocarpa* is not unlike *C. Oxyacantha* in general aspect, but the fruits are black; it is a native of Tauria, &c. *C. Pyracantha*, the Evergreen Thorn, a native of South Europe, rarely produces its beautiful fruits in anything like abundance except it is treated as a wall plant. *C. P. Lelandi* is a garden form, which fruits freely in a young state. *C. tanacetifolia* has deeply-cut, greyish, Tansy-like leaves, and large, yellowish, Medlar-like fruits; it is a native of the Levant, and one of the most distinct of the cultivated Thorns.

Cytisus.—There are about two-score species in this genus as it is now understood, but not many are worthy of special mention here. *C. albus*, the White Spanish Broom, is one of the best of hardy shrubs, flowering in May; the common British Broom, *C. Scoparius*, is also well worth a place in the garden. *C. nigricans* is a free-flowering shrub, with trifoliolate leaves, and erect, elongated, terminal racemes of golden-yellow flowers; it is a European species, from three to six feet high, and is perfectly hardy. *C. purpureus* is a beautiful Alpine shrub, with glabrous obovate leaflets, and flowers (usually borne in pairs in the axils of the small leaves) rosy-purple, white, or dull purple in colour; as a rule this is grafted on the common Laburnum.

Dabeocia.—The only member of this genus is *D. polifolia*, St. Dabeoc's Heath, a native of Western Europe—in the British Islands being only found in the boggy heaths of Connemara and Mayo. It is a pretty evergreen shrub, one or two feet high, with shortly-stalked oval leaves, bright green and glossy above, and white woolly beneath; the urn-shaped flowers are borne in erect terminal racemes, and vary in colour from crimson-purple to white. In one of the garden forms, *versicolor*, purple and white flowers, and others intermediate between the two, are produced by the same plant. Dabeocia thrives in a damp peat border, and makes a charming companion plant to the hardy Heaths.

Daphne.—About fifty species of Daphne are known to botanists, and perhaps about half that

number are in cultivation. All hail from temperate regions of the Old World. *D. alpina*, from the European Alps, is a pretty dwarf evergreen, with white or rose-coloured deliciously fragrant flowers. *D. Blagayana*, a rather recent introduction from the mountains of Eastern Europe, has dense heads of somewhat large fragrant flowers. *D. Cneorum*, with bright pink scented flowers, is an evergreen trailer; this, as well as the two preceding species, hardly attains a foot in height. The first flowers from May to July, and the second and third in April. *D. collina* is an erect hardy evergreen, two to three feet high, with silky pinkish flowers, and blunt oblong-ovate leaves, shining above and woolly beneath; it is a native of Southern Europe. *D. Genkwa* is a handsome Japanese species, with purple flowers springing from the slender leafless branches in April. *D. laureola*, the Spurge Laurel of the British flora, is an evergreen two or three feet high, with leathery leaves some four or five inches long, and clusters of greenish-yellow flowers appearing from January to April; it generally affects stiff soils, and thrives well under the shade of trees. *D. Pontica*, a species from Asia Minor, is very similar to *D. laureola*, but differs in its light green leaves and deeper yellow flowers; these two are frequently used as stocks whereon to graft the smaller-growing rarer kinds. *D. Mezereum*, a deciduous shrub, with very fragrant red or white flowers, which open from February until April, is a popular old-fashioned plant, which thrives under various conditions as regards soil, but appears to do best in a good stiff loam. All the other Daphnes above mentioned like a well-drained, moist, peaty border.

Desmodium penduliflorum is the garden name for the very handsome *Sespedeza bicolor*. It has trifoliolate leaves and long drooping racemes of beautiful purple-red Pear-shaped flowers; it attains a height of about six feet, and should be attached to a stake in good rich ground, so that its graceful habit and wealth of richly-coloured flowers may be seen to best advantage. A native of North-eastern Asia.

Deutzia.—Of the half-dozen species of this genus, all of which are now or have been in cultivation, the two best are the Japanese *D. crenata* and *D. gracilis*. Both do well, either as pot plants or in the open shrubbery, and thrive best in a good stiff loam. The first-named varies somewhat in colour, and possesses both single and double forms—one, *candidissima*, having pure white double flowers—and *extus purpurea*, double purplish-tinted blossoms. These grow, under favourable conditions, about six feet high, and flower profusely. *D. gracilis* is the smallest of the group; it rarely exceeds a couple of feet in height, and produces a profusion of elegant racemes of pure white flowers. Both species are excellent subjects for forcing purposes.

Diervilla.—There are about seven species in this genus, which is restricted to North America, China, and Japan. Only the Japanese and Chinese ones can be recommended for general cultivation, and these are very beautiful, free-flowering, and easily-grown deciduous shrubs. The garden varieties are especially noteworthy, as these vary from pure white to dark red and rich deep rose.

Elæagnus.—The genus hardly contains, so far as at present known, more than a dozen really distinct species; these are distributed over South Europe, temperate and tropical Asia, Australia, and North America. *E. angustifolia*, a native of Southern Europe, is a small hardy tree, with entire narrow leaves, which, as well as the twigs, are clothed with glistening silvery scales. The yellowish fragrant flowers are produced in clusters of three or four, or singly, from the axils of the leaves; the red fruits are eaten in some countries. Apart from flowers and fruit, both certainly ornamental, this handsome little deciduous tree is well worth a place in the park or pleasure-ground for the distinctly silvery foliage. *E. argentea*, the Silver Berry of North America, has oval silvery leaves and edible mealy fruit; it is a very hardy deciduous shrub. *E. glabra*, a Japanese species, is an evergreen, with dark green leathery leaves, which in the adult condition are smooth above and clothed beneath with rusty-coloured scales. There are several distinct and desirable variegated forms of this. *E. longipes* has oval leaves, green above and silvery-white beneath; the long-stalked, translucent, orange-red fruits are studded with small reddish-brown scales, and a bush laden with them is most ornamental. *E. macrophylla*, like the last, a Japanese spineless shrub, is an evergreen, with large roundish-ovate leaves. *E. pungens*, from the same botanical region, is a smaller-leaved evergreen, of which there are several variegated garden forms, with spiny branches. All the Elæagnus seem to prefer a rather dry soil, and are readily raised from seeds, cuttings, or layers.

Empetrum nigrum, the Crowberry of Britain, is a neat, compact-growing, trailing evergreen, with Heath-like leaves and black fruits; the North American form of the species has often purple fruits, whilst those of the South Chilian and Fuegian variety (*rubrum*) are red. It grows freely in any peat border, and makes a deep green dense edging.

Erica.—The head-quarters of the genus *Erica* (there are about four hundred species) is in South Africa, but there are many in North Africa, Europe, and Asia. The best of those which are hardy enough to live in the open air in Britain are mentioned below:—The South European, *E. arborea*, not unfrequently attains the dimensions of a tree; it has white axillary racemose flowers, and tomentose branches. From the roots, knobs, and stems of this species, which are largely imported into this country, are made the so-called Briar-root pipes of the shops, "Briar" being a corruption of the French *Bruyère*. *E. carnea* is a very floriferous dwarf-growing species from Central and Eastern Europe; it grows about six inches high, and flowers from January to April. The white variety, *E. herbacea*, is a beautiful little plant, a charming companion to the pink-flowered type. *E. ciliaris* has unilateral racemes of rather large crimson flowers; it is a beautiful species, attaining a height of twelve or eighteen inches, and is a native of Western Europe. In the British Islands it is confined to sandy heaths in Cornwall and Dorset. A hybrid between this species and *E. tetralix*, the Cross-leaved Heath, is found in both the counties named; it is a pretty plant, and well worth a place in any peat border. *E. cinerea*, the badge of the clan M'Donald, is a West European species, widely distributed throughout the British Islands; some of the garden varieties, with flowers varying in colour from crimson and purple to white, are very pretty plants. *E. stricta* has red-purple flowers, produced in a kind of terminal umbel; it grows two or three feet high, and is a native of South-western Europe. *E. tetralix*, a common British species, has flowers varying from rose-red to pure white, and under cultivation makes a very handsome plant; an Irish variety of this, *E. Mackayana* (also found in Spain), is a very free-flowering, compact-growing plant, somewhat dwarfer than the type, and with deeper-coloured flowers. *E. vagans*, the Cornish Heath, varies from red or white to pink; it is an erect species, attaining under favourable conditions a height of three feet. All the Ericas thrive best in a peat border, although some do fairly well in ordinary garden ground, provided the ground is kept moist, and no chalk or lime is present in the soil.

Escallonia.—All the Escallonias—some thirty species are known to botanists, and about half that number are, or have been, in cultivation—are desirable half-hardy evergreens. Some of them are amongst the most handsome of flowering shrubs; for example, *E. macrantha*, which flourishes so well by the sea on the south coast of Britain, and forms a splendid edge with its dark glossy leaves, and large crimson-red flowers. *E. Phillipiana* has small green leaves, and terminal and lateral panicles of white flowers. *E. pterocladon* has tiny leaves, and a profusion of white and pink flowers. *E. punctata* has deep dark red flowers, and shortly-stalked, oval, acute, serrated leaves; it is readily distinguished from *E. rubra*, a similar species, by the stalked glands on the young shoots, &c. All the Escallonias make excellent wall plants, and they are well worth the protection of a wall where they would be in danger of being killed by cold winters if planted in less sheltered spots. They propagate readily from cuttings, and grow rapidly in almost any soil.

Euonymus.—Not fewer than forty species of Euonymus are known, and a goodly proportion of these have been introduced to this country. They are evergreen or deciduous shrubs, or small trees, and are natives of Europe, Asia, and North America. Our native *E. Europæus*, the common Spindle-tree, is a deciduous shrub, or small tree, ranging from four, or six, to twenty feet in height, and when laden in autumn with its pale crimson capsules, which open and display the orange-coloured arillodes, it is very beautiful. *E. Japonicus* is one of the most variable of evergreens; the ordinary form has large, leathery, dark green leaves, and is one of the best of shrubs for sea-side planting; *E. radicans* is a procumbent form with small leaves, and *E. radicans variegata* a variegated form—the last-named is one of the best of variegated shrubs for making an edging, or border, as it bears cutting well, and is bright and decided in colour. When planted against a wall, and allowed to develop at will, it soon produces branches with much larger leaves than usual, and then commences to flower; the ordinary small-leaved state is always barren. Besides these, there are numerous varieties with different gold and silver variegation. *E. latifolius*, a European deciduous species, is nearly allied to *E. Europæus*, but differs in its larger leaves and fruits. The deciduous species produce an abundance of seed, by which they may be readily propagated; the evergreen ones, which rarely fruit in this country, may be increased by cuttings, or by grafting.

Eurybia.—Some of the members of this Australian genus make beautiful objects in the South-west of England (and even much further north if accorded the protection of a wall). *E. Gunnii* has Daisy-like flower-heads, and flowers very freely in rather dry, well-drained localities.

Exochorda.—Of the three species of this genus already known, only one, *E. grandiflora*, is probably yet in cultivation in British gardens; it is a very

handsome, hardy, deciduous shrub, with large white flowers, produced in elongated racemes in May. It thrives in any soil, but likes a rich loam, and a sunny situation. All the Exochordas are natives of Eastern Asia.

Fabiana imbricata is the only member of the genus *Fabiana* which is worthy of mention here. It is a beautiful, erect, Heath-like shrub, with white funnel-shaped flowers produced in great profusion in May and June. In the Southern counties, and particularly along the coast, it forms a fine bush in the open border; elsewhere it is better to accord it the protection of a wall or some similar shelter. It thrives well in a peat border, but does fairly well in soils in which no peat is present. A native of Chili.

Fagus (*Beech*).—Of the fifteen species of Beech now known to botanists, only our common native Beech, *F. sylvatica*, and its North American ally, *F. ferruginea*, are worthy of mention. The former varies very considerably in habit, in the colour and cutting of its leaves, &c. Its geographical distribution is rather curious, as in Europe it occupies a triangular area between Norway, Asia Minor, and Spain, and it is also found in Japan. The common form is too well known to need description; it is one of the noblest of all our native trees, and attains a large size, particularly on chalk and limestone. The Copper and Purple Beeches, *F. s. cuprea* and *F. s. purpurea*, are among the best of foliage trees for striking landscape effects, and *F. s. pendula* is one of the boldest and most picturesque of weeping trees. *F. s. Remilliensis* is another form of weeping habit, a much more formal tree than the last-named variety; it is best suited for covering an arbour, where its regularly pendulous branches will soon form a dense shade—in habit this is not unlike the Kilmarnock Weeping Willow. *F. s. asplenifolia*, or as it is sometimes called, *F. s. Comptoniæfolia*, has elegantly cut Fern-like leaves, and erect or ascending branches. Besides these there is a silver variegated form, another with golden-margined foliage, &c.

Forsythia.—This genus comprises a couple of species, both natives of China and Japan. They are very ornamental, deciduous shrubs, of the easiest cultivation. *F. viridissima*, an erect-growing bush, has simple, entire leaves, and flowers abundantly in March and April; this sometimes attains a height of ten feet, but is generally met with from three to six feet high. *F. suspensa*, on the other hand, is a graceful creeper, with long flexible shoots, and simple or trifoliolate leaves; although this flowers profusely when grown as a bush in the ordinary shrubbery, its beauty is best seen when planted against a wall, and its long shoots annually nailed in; under such conditions it forms a mass of bright yellow flowers. *F. Fortunei* and *F. Sieboldi* vary very slightly in colour, and have long and short styles; in fact, are exactly analogous to the pin-eyed and the thrum-eyed individuals of the common Primrose, &c.

Fothergilla alnifolia.—The only species of the genus is a dwarf-growing, deciduous shrub, with white, fragrant flowers, which appear in April and May before the Alder-like leaves are developed. It is a native of North-eastern America, and thrives best in a moist peat border. There are several varieties, differing more or less in the shape of the leaves, &c.

Fraxinus (*Ash*).—About thirty species of Ash are known, nearly all of which have been, or are, in cultivation. They are confined to temperate regions of the northern hemisphere, and the species mentioned below are the most distinct and ornamental. *F. Americana*, the White Ash of the North-eastern United States, is a large forest tree, with grey furrowed bark, smooth grey branchlets, and rusty-coloured buds. *F. excelsior*, our native Ash, has a large number of garden varieties, many of which are superior to the type for purposes of ornament. *F. e. pendula*, the Weeping Ash, is one of the most popular of weeping trees, and of this there is a form with yellowish bark. *F. e. heterophylla* is a curious form in which the lateral leaflets are suppressed, and the leaf is generally composed of but the terminal leaflet, a state of affairs which not unfrequently occurs amongst trees with pinnate leaves. *F. e. crispa* has very dark green curled foliage, but is more curious than beautiful. *F. Mariesii* is a Japanese species which has been recently introduced to this country. It belongs to the *Ornus* group, in which the petals are present, and add considerably to the beauty of the tree. Unlike the section of which the common Ash may be taken as the representative, the flowers are produced at the same time as the leaves, and the copiously branched panicles give a graceful feathery appearance to the trees. *F. Ornus*, the Manna Ash or Flowering Ash of Southern Europe, is, with the exception of the last-named, the handsomest Ash in cultivation. Its greenish-white flowers are borne in plume-like clustered panicles, and are particularly conspicuous in May and June. *F. quadrangulata*, the Blue Ash of the North-eastern United States, has bold leaves a foot to a foot and a half in length; it attains a height of sixty or seventy feet, and is readily distinguished from its allies by its square branchlets.

Garrya.—Of the eight species of this genus known to botanists, only one, *G. elliptica*, a Californian shrub, is worthy of mention here; it is a pretty evergreen, with long clustered catkins of yellowish-green flowers, produced in spring. The male plant is much more ornamental than the female, which is rare in gardens. In the South of England. *G. elliptica* thrives well in the open shrubbery border, but in the Northern counties it should be grown against a wall. It is readily propagated from cuttings, and should be more generally grown, as it is one of the most elegant of ornamental evergreens.

Genista.—Upwards of seventy species have been described in this genus, all of them restricted to Europe, Northern Africa, and Western Asia. *G. Ætnensis*, a native of Sicily and Sardinia, grows about ten or fifteen feet high, and has slender, arching, almost leafless twigs, laden in June and July with racemes of golden-yellow flowers. *G. Anglica*, the Needle Furze of Britain, is a spiny shrub a foot or two in height; it is a pretty shrub, well worthy of a place in the front of the shrubbery border. *G. Anxantica*, a South-west European species, is not unlike our native *G. tinctoria*, or Dyer's Greenweed; it is a very floriferous dwarf-growing plant. *G. Hispanica*, often met with in nurseries under the name of *Ulex Hispanicus*, is a spiny shrub, with terminal racemes; it forms a dense, compact mass a foot or two in height. *G. elata* is simply a strong, tall-growing form of *G. tinctoria*, being twice or thrice as tall as that species. *G. sagittalis* and *G. triangularis* are prostrate shrubs with winged branches—both being natives of South Europe, and flowering in spring and summer. All the species above-named are yellow-flowered ones, and are readily raised from seeds, which ripen freely in this country.

Gleditschia.—Three species of this genus are in cultivation, and are ornamental, deciduous, hardy trees, with feathery leaves. *G. monosperma*, the Water Locust of the North-eastern United States, differs principally from *G. triacanthos*, the Honey Locust of the same country, in its one-seeded pods. Both are handsome trees, perfectly hardy, and of the easiest cultivation. *G. Sinensis*, a Chinese species, has stem and branches, perhaps, more formidably armed with stout branched spines than either of the two preceding. The flowers of all are greenish and inconspicuous.

Gordonia.—This genus comprises about ten species of very ornamental flowering shrubs allied to Camellia. *G. Lasianthus*, the Loblolly-Boy of Virginia, &c., and *G. pubescens* (also from North America) have large, white, fragrant flowers, produced in July and August. It is probably only in the South of England that they are hardy when unprotected in the open shrubbery, but they are so handsome as to merit a place on the wall in any garden.

Gymnocladus Canadensis (*The Kentucky Coffee Tree*), whether in a young or large state, is very unlike any other tree cultivated in the open air in Britain. It is quite hardy, and by no means particular as to soil. If kept in a dwarf state, like the Alianthus, it will produce very large foliage, and form a striking clump on the lawn for summer effect; the dull bluish-green leaves are often three feet long by nearly a couple of feet broad; there are several large, partial leaf-stalks, bearing from seven to thirteen ovate stalked leaflets, the lowest pair with but single leaflets. The large pod is from six to ten inches long by a couple of inches broad; the seeds—over half an inch across—having been used by the early settlers as a substitute for coffee, gave the tree its commonly-accepted English name. In the Eastern United States it attains a height of sixty or eighty feet, with a trunk sometimes two feet in diameter.

Halesia.—About six species are known of this genus of the Styrax family, one-half of which hail from North-east America, and the other from China or Japan. The common Snowdrop, or Silver-bell Tree, *H. tetraptera*, is a beautiful spring-flowering deciduous tree or shrub, with clusters of large, pure white drooping flowers, somewhat resembling those of the Snowdrop. When laden, in summer and autumn, with its four-winged fruit, which are from one to two inches in length, a good specimen of this tree presents an elegant appearance. This species was probably first cultivated in this country by Bishop Compton, a distinguished prelate and eminent patron of botany at the beginning of last century, and in old-fashioned gardens fine trees may frequently be met with. *H. diptera* principally differs from *H. tetraptera* in its two- (not four-) winged fruits, and *H. parviflora* is a Southern United States species with smaller flowers. *H. hispidæ*, formerly known as *Pterostyrax hispidæ*, a Japanese deciduous shrub of recent introduction, has large heart-shaped leaves, and drooping paniculate inflorescence of pure white flowers.

Halimodendron argenteum, a native of Russian Asia, is the only member of this genus of the Pea family. It is a pretty, deciduous shrub, with abruptly pinnate, silky leaves, composed of a

couple of pairs of leaflets. The large pink Pea-shaped flowers are produced from May to July, and form a pleasing contrast to the whitish foliage. Halimodendron is perfectly hardy in this country, and is generally grafted on the common Laburnum.

Hamamelis.—This genus gives its name to the small order *Hamamelideæ*, which contains several dissimilar, but very interesting and pretty shrubs and trees, amongst which may be mentioned Fothergilla, Liquidambar, and Loropetalum. The three species of *Hamamelis*—all of which are in cultivation—are easily cultivated, decidedly ornamental shrubs, thriving in a good damp loamy soil, but flowering freely even in dry, poor, gravelly situations. *H. arborea* is the tallest, sometimes, it is said, attaining a height of from fifteen to twenty feet; it has larger flowers, with long strap-shaped petals of a clear primrose-yellow colour, than either of the two following species. *H. Japonica*, like *H. arborea*, a native of Japan, is a compact, free-flowering, dwarf bush, with lemon-yellow flowers. *H. Virginica*, the Witch-Hazel of the North-eastern United States, is the best known of the group, and has long been in cultivation in this country; it is, however, far less common than it deserves to be. Its clusters of yellow flowers are borne in great profusion on the leafless twigs during the winter months, and the fruits ripen the following summer. This species is especially fitted for planting along watercourses, or in damp, rather open spots in woods, &c. *H. arborea* and *H. Japonica* may, in default of seeds, be grafted on *H. Virginica*, or they may be increased by layering.

Hedera (*Ivy*).—As now understood, this genus comprises but a couple of species, one limited to Australia, and the other, our native Ivy, widely distributed, in one or other of its numerous forms, throughout temperate regions of the northern hemisphere. Few climbers are so useful as *H. Helix* and its host of garden forms. In Continental gardens, even more than in British ones, the great value of Ivy is thoroughly appreciated. In addition to its use for covering walls and unsightly buildings, it is largely employed as edgings to massive beds or borders, and for forming elegant and very effective screens, which do not take up a quarter the space a hedge would require, and are much more ornamental. The long climbing or trailing stems are nearly, if not always, barren; it is only when the plant has outgrown its support, and developed short, bushy growths, with leaves nearly always dissimilar in outline from those of the juvenile condition of the plant, that flowers are produced. These flowering shoots if grafted on common strong-growing stock, such as that furnished by the ordinary so-called Irish Ivy (*H. Canariensis*), maintain their tree-like habit, and constitute what are known in gardens as Tree Ivies. It would be impossible, for lack of space, to enumerate all the garden varieties, small and large-leaved, tree and climbing, gold and silver variegated, which may be met with in the collections of Ivy-lovers, and in the catalogues of those nurserymen who make a speciality of the Ivy; only the more remarkable of the different groups are mentioned. Perhaps the most useful of all the large-leaved varieties is the common Irish Ivy; other large-leaved forms are the variegated form of the last, generally known as *latifolia variegata*, a distinct and pretty plant variously blotched and veined with creamy-white, but apt in most places to revert to the ordinary green-leaved type. *Algeriensis* has light green leaves, and is one of the best of its set; *Rœgneriana* has large, dark green, leathery, heart-shaped leaves, and is moreover a fast grower; the tree form of this is one of the most striking of all the Tree Ivies. *Dentata* is not unlike *Rœgneriana*, but has less glossy leaves, which are not unfrequently distinctly toothed. Of the small-growing kinds, *aurea marginata*, *argentea marginata*, *gracilis*, *digitata*, *palmata*, have names sufficiently descriptive to indicate their respective peculiarities.

Helianthemum.—About 150 forms of *Helianthemum* have been described as species, but it is probable that not more than thirty have decided claims to specific rank. Several of them are wonderfully pretty garden plants, and thrive well in almost any soil or situation, provided they can obtain plenty of sunlight. *H. formosum*, so frequently found in catalogues under the name of *Cistus formosus*, is a beautiful shrub some four feet or so in height, with large, bright yellow flowers, each petal bearing a blackish blotch at its base; it is a native of Portugal, and has long been known in English gardens, though, on account of its being liable to succumb during severe winters in many parts of the country, it is not so largely grown as it certainly merits to be. *H. polifolium*, a beautiful prostrate shrub, with white flowers, and silky greyish leaves, is a British plant, and of course thoroughly hardy; there is a pretty variety with rosy-red flowers. Of *H. vulgare*, the common British Rock-rose, there is a large number of garden forms, varying from white and yellow to copper-coloured and deep red; of many of the shades there are double states.

Hibiscus.—The only member of this extensive genus of Mallowworts which comes within the scope of these articles is *H. Syriacus*, the *Althæa frutex* of some catalogues. Of this species there are very

numerous garden forms, with single and double flowers, ranging in colour from white to yellow, rose, purple, and violet, &c. It hardly attains a greater height than about six feet, and flowers abundantly towards the close of summer, and during early autumn. It is a native of Syria, whence it was introduced to this country at the close of the sixteenth century.

Hippophæ.—In dry gravelly or sandy soils, *H. rhamnoides*, the Sea Buckthorn of the British coasts, is the only British member of the order *Elæagnaceæ*, and forms a very ornamental shrub, or small tree. Under suitable conditions it makes slender, almost pendulous branches, clothed with narrow Willow-like, silvery leaves, and if both sexes are present—male and female flowers are produced by different individuals—a crop of small orange-red fruits succeed the inconspicuous flowers. The Himalayan form of the species, *H. salicifolius*, perhaps grows rather taller than the type, and on that account is somewhat preferable for some situations.

Hydrangea.—Upwards of thirty species of *Hydrangea* are known, and a large proportion of these are, or have been, in cultivation. Not more than three or four, however, are worthy of mention here. *H. hortensis*, the common Chinese species, which is so largely grown with such excellent effect in the South-western counties, varies exceedingly; in some—and these are perhaps the most showy—all or nearly all the flowers are quite sterile; in others, the ray-flowers only are barren, and the inner ones fertile. Then, again, the colour ranges from pink, white, or blue, according to the season, or the nature of the soil in which they are grown; and there are also double varieties, besides others with silver and golden variegated leaves. Given a tolerably sheltered place, and good rich soil, there is no reason why *H. hortensis* should not be much more widely grown as a border plant in the open air instead of being restricted so much to pot-culture. *H. paniculata*, a Japanese species, has an elongated, paniculate (not flat or rounded) inflorescence; it has dull green, pubescent leaves, and, if planted in good loam, and the older stems cut back annually, forms a fine bush some three feet or so in height, and develops its starry flowers in large panicles a foot or more in length. This species is hardier than the last-named, and is well worthy of general cultivation. *H. petiolaris* (generally met with under the erroneous name of *Schizophragma hydrangeoides*) is a climber, with broadly-ovate, heart-shaped, serrated dark green leaves, and slender branching stems, which attach themselves to a wall, or similar support, and root against it like Ivy. It has a very large flat inflorescence, the large outer white flowers being sterile, and the small greenish inner ones fertile. *H. quercifolia* has large, ovate, sinuate leaves, not unlike those of some of the large-leaved American Oaks in outline, and large panicles of white flowers; this is a native of the Southern United States, and except against a wall, or in a sheltered position, is only hardy in the Southern counties.

Hypericum.—This genus, which gives its name to the order *Hypericaceæ*, contains about 160 species, and is found in most parts of the world. A large proportion, however, are herbaceous plants, and, therefore, out of place here. Of the shrubby species the following are the best for general cultivation:—*H. Androsæmum*, the common Tutsan, a British plant, is suitable for planting along woodland paths, and in damp shady spots; its yellow flowers are not so large as those of some of its allies, but it is a pretty plant, well worth a place in the shrubbery. The South-east European, *H. calycinum*, frequently called the Rose of Sharon, has the largest flowers in the genus; it is a creeping shrub, nearly evergreen, admirably adapted for clothing banks with a dense carpet of glossy dark green leaves, studded with golden-yellow flowers three to four inches in diameter. *H. elatum*, a North American species, differs from *H. Androsæmum*, which it somewhat resembles, in its longer styles and rather larger flowers. *H. Hookerianum*, or, as it is frequently called, *H. oblongifolium*, is a Himalayan evergreen, with large flowers, and glossy, dark green, oval leaves. *H. Kalmianum* and *H. prolificum* are two nearly-allied North American species, with narrow leaves; they are remarkable in having very numerous stamens, only slightly united at the base into five bundles.

Idesia polycarpa is the only species of a genus belonging to the order *Bixineæ*, which is only represented in British shrubberies by the South American Azaras, and the subject of this paragraph. It is a deciduous, round-headed, small tree, with large heart-shaped, acuminate, remotely serrulated, long-stalked leaves, and drooping panicles of unisexual flowers; the male plant is the more showy, the small flowers being orange-coloured; the female flowers are greenish, and are succeeded by large clusters of small purplish-black fruits. It is a native of Japan, and a somewhat recent introduction to this country.

Ilex (*Holly*).—Of the 150 species of Holly known to botanists, only some half a dozen or so are worth growing, except in tree collections. The genus is found in temperate and tropical regions of both hemispheres, and a large proportion of the species are not hardy in Britain. Only the most remarkable and desirable of those which are worthy

of general cultivation are mentioned here. The general properties of the genus are antiseptic and astringent; the berries of the common Holly are purgative and emetic, and the bark yields bird-lime. *Ilex Paraguariensis* furnishes Paraguay-tea, or Maté: this species, which will only thrive in the open air in this country in the most favoured spots, is largely cultivated in Paraguay and Brazil, and the consumption of the dried leaves is enormous in South America. *I. cornuta*, from China, is a very distinct plant with hard dark green leaves, which are generally furnished with five horn-like spines. *I. crenata*, a Japanese species, of which there are variegated forms, and one with roundish leaves, has small, ovate, crenate leaves; it is a small, compact grower, and is suitable for making a neat low hedge; indeed, at one time, it was recommended as a substitute for Box as an edging. *I. dipyrena* hails from Northern India; it has brownish berries and long, shortly-stalked, remotely spiny-serrated leaves. *I. latifolia*, from Japan, has large leaves from six to nine inches long or more, and is one of the most distinct of all the Hollies—probably, however, this cannot fairly be called hardy except in the South and South-western counties. *I. opaca*, the North American representative of our common British Holly, forms a tree from twenty to forty feet high, but its deep green foliage is less glossy, and its berries are not so red as are those of our native plant. *I. glabra*, formerly placed in a genus apart from *Ilex* (*Prinos*), and still frequently met with in books under the name of *Prinos glaber*, is the Inkberry of the United States; it forms a pretty, dense-habited bush, some two or three feet in height, and in June its white flowers contrast markedly with the small, wedge-shaped, dark green leaves. Undoubtedly the most popular, and for general decorative effect the most useful of all the Hollies is *I. Aquifolium*, of which there is a host of garden forms, sports, and seedling varieties, differing wonderfully in the size, form, colour, and prickliness of the leaves, and the colour of the fruits, these ranging from the bright scarlet of the wild plant to white, yellow, or black. Amongst the best of the green-leaved set are *Balearica*, with large, ovate-acute, shining, flat, and entire or spiny-toothed leaves; *crassifolia*, with very thick, dull green leaves, the margins of which are furnished with prominent saw-like teeth; *ferox*, the Hedgehog Holly, the leaves of which have their margins armed with strongly developed spreading spines, and the convex upper surface beset with spiny prickles. *Hodginsii* is a handsome form, with large ovate leaves, with strong distant marginal spines. *Ovata* has ovate leaves with regular, angular, scarcely spiny teeth. *Pyramidalis* is a compact, neat-growing, small-leaved form, with six or eight pairs of spines on the same plane as the leaf. *Tortuosa*, often called the Screw Holly, has spirally twisted, rarely spiny leaves.

The finest of the gold and silver variegated forms are the following:—*Argentea elegantissima* has the centre part of the leaf dark green with grey blotches, and the margin creamy-white. *Argentea marginata* has an irregular, narrow, silvery margin, the centre being dark green, slightly mottled. *Argentea medio-picta* has a large central blotch of creamy-white, the margin being dark green; this is often called the Silver Milkmaid. *Aurea latifolia* has the middle of the leaf dark green, splashed with paler green, and a well-marked but irregular margin of golden-yellow. *Aurea picta latifolia* is a handsome and distinct form known in nurseries as the Golden Milkmaid; it only differs from the Silver Milkmaid in the variegation being yellow instead of white. *Ferox argentea* is the silver variegated form of the common green-leaved Hedgehog Holly. *Handsworthensis* is a beautiful free-growing form, with strong, prominent, white spines, and a distinct margin of creamy-white.

Illicium.—This genus of *Magnoliaceæ* contains five species of beautiful, fragrant-flowered, evergreen shrubs, which do well in the open air in some places in the South of England, but elsewhere require the protection of a wall. *I. anisatum* has terminal clusters of yellowish-white flowers; it has ovate-lanceolate leaves, and attains a height of about four feet under cultivation. A native of China and Japan. *I. Floridanum*, from the Southern United States, has deep red flowers, and is a taller grower than the first-named species.

Indigofera.—Few of the species of this handsome genus are hardy except in very favoured localities; perhaps the one which succeeds best in the open air is the Himalayan, *I. Gerardiana*, with its neat, bright green, pinnate leaves, and many-flowered racemes of pink flowers; it is a very floriferous shrub, thriving well in the Southern counties in the open shrubbery, but probably requiring the shelter of a wall in others. In gardens it is met with under a variety of names, of which the most common are *I. coronillæfolia* and *I. floribunda*.

Itea.—Of the five species of this genus of *Saxifrageæ* only one, *I. Virginica*, from the United States, is worthy of special mention. It is a pretty, autumn-flowering, deciduous shrub, with Willow-like leaves, and innumerable, erect, simple racemes of small white flowers. It only attains a height of from three to six feet, and thrives best in a damp peat border.

SMALL AND BUSH FRUITS.

By D. T. Fish, assisted by William Carmichael.

THE RASPBERRY.

THIS—alike for eating for dessert; conversion into jam; the making of tarts, either alone or with a certain proportion of Currants; conversion into wine and Raspberry vinegar—is one of the most esteemed and popular of all our dessert fruits. Unlike the Gooseberry and the Currant, the Raspberry, even in a wild state, is often found of good size and of high quality; though cultivation greatly improves it, and several superior varieties have been raised. The stems are biennial; that is, those produced one year fruit the next, and then die. So that Raspberries always run, as it were, two crops abreast; that is, one of fruiting, and the other of growing shoots. Both of these shoots are called canes, from their smooth and straight character, and the chief art in Raspberry culture is to maintain a constant succession of these canes as strong and as straight as may be.

The Raspberry is held to be sanitary as well as pleasing and refreshing, and its use either in sauces, sweets, ices, or cooling cordials, or syrups, is strongly recommended for children and invalids. The yellow varieties especially are very much prized for the dessert, and for this purpose they should be gathered with the husks, which improves their appearance, and adds to the convenience of eating them. The Raspberry is extensively cultivated in private and market gardens, but hardly to the extent its great merits entitle it to, and as fruit becomes of more importance in the future economy of our agriculture, doubtless not a few fields now devoted to the production of corn will be planted with Raspberries, and thus help to satisfy the insatiable demand for this popular fruit.

Propagation.—Practically there is but one method of propagation, and that is by suckers. The plants of Raspberries are really aggregates of plants called stools. Each stool is composed of from three to seven canes—four being a good average. From each of these separate canes, one or more offsets, or suckers, may arise. The two terms are not used here as being synonymous, neither are they so in fact; for in hardly anything do different varieties of Raspberry differ more than in the number and manner of their suckers. Some have few; others, many. In some the sucker is so close to the plant as to be a mere offset from it. In others the suckers come up six, nine, twelve, eighteen inches or more from the plant.

Baumforth's Seedling is a striking example of a far-running numerous sucker variety, while Prince of Wales is an example of one with few and closely placed offsets. The distinction is of considerable practical importance, as those that have many suckers widely distributed are easily propagated, the suckers being well rooted and easily detached without injury to the stools. On the other hand, varieties with close offsets must be handled with care, as otherwise the plants are seriously injured by the removal of the sucker, and it is also difficult to get sufficient rods with each.

There is also occasionally the further difficulty of obtaining sufficient suckers where the demand for plants is urgent. However, by generous culture, and careful painstaking over all the suckers produced, a sufficient number may mostly be found to meet the demands for fresh plantations.

The Best Time to Remove and Plant Suckers.—This is doubtless about the last week in October. Prepare the ground for their reception before interfering with the suckers. Then, with a sharp spade, or an implement called a suckering-iron, a sort of hybrid between a chisel and a spade that has almost disappeared from our modern gardens, remove the sucker, with as many roots as possible, and immediately plant it, either singly or in twos or threes, in the fresh soil.

There are, however, two other methods of propagating Raspberries that must have a passing notice before we proceed to plant them; that is, by cuttings and seeds.

Cuttings of the nut-brown young wood of the current year, that is, of the young canes from nine inches to a foot in length, should be inserted about the middle of October. The soil should be rather light and sandy, and if a little leaf-mould, or cocoa-fibre refuse, or road-sand, can be placed under the base of the cuttings so much the better. Plant them exactly as described for Rose-cuttings, and make them as firm as possible. A partially shaded position, such as is provided by a north or east border, is the best for Raspberry cuttings. A liberal percentage of these may be expected to produce roots, but unless there is a scarcity of suckers, Raspberry cuttings are not worth the trouble.

Raspberries come freely from seeds, and, of course, this is the only way of obtaining improved varieties. Comparatively little has been done in this direction, and the greater number in cultivation appear to be careful selections rather than new and original seedlings. In all probability the Raspberries of the future may be further enlarged, and otherwise improved, by crossing with other species of *Rubus*, and in other ways. There is no difficulty in raising the plants. Wash the seeds out of the fruit, and moderately dry in the sun, to secure even

sowing and regular distribution, as well as to prevent the seeds moulding. Sow in small quantities in pots or pans of light soil, and place in a cold frame; or in larger quantities in the open. The plants will come up in the spring, and will make such good progress as to be fit to turn out in nursery-beds, or rows, in the autumn. The next season they will be fit to plant out permanently, and within three years will form fair fruiting plants. Seeds, however, of the ordinary strain very seldom produce anything equal to themselves, but seem to have a strong tendency to revert to more primitive and worse forms, alike in size and quality.

The Planting.—The soil can hardly be too rich, deep, and moist for these plants. In good loam, mixtures of peat and loam, and loam mixed with leaf-mould, and half-rotted tree-leaves—in a word, in almost all soils porous as well as rich, and considerably mixed, the Raspberry is at home. It cannot make way in stiff loam, nor anything like clay, that bakes and cracks in hot weather. If it must be grown in such, they must first be burned, and freely incorporated with heavy dressings of cinder-ashes, mortar-rubbish, and farmyard manure. A deep tilth of about a yard or more should be provided, and care should be taken to place the best food about a foot from the surface, that being the maximum feeding-line of Raspberry-roots.

Mode and Distance to Plant.—So much has been said about disbudding and the removal of suckers from other bushes and trees, that a caution must be given here against the application of any such methods to Raspberries. Leave all the root-buds and embryo suckers intact. These are the canes of the next year in embryo, and must not be disturbed by any means. As to distance apart, that varies in places from three to six feet between the rows, and two to four from plant to plant. A yard between the stools, and four feet from row to row, are good average distances where the Raspberries are to occupy all the ground. Some plant considerably closer, and cut the canes lower, thus dispensing with the necessity of stakes. But Raspberry plantations treated thus have mostly a rather slovenly appearance, and never look so orderly as those tied up to stout stakes from three to four feet high, with rope-yarn, or willow, or rattifai grass, which lasts a season well. For forming quadrants against walks, or arched training in the line of the row—half the canes being carried one way, and half the other—there are no better distances than from four to five feet. Against walls, or espaliers, especially if these exceed a yard or four feet in height, a greater proportion of root-force to area is most desirable, so as to concentrate it into climbing, and covering the space sooner. Hence, the canes might be planted so closely as fifteen or eighteen inches, and each stool limited to the production of not more than one or two canes. In this way overcrowding is prevented, and the utmost vigour insured.

In ordinary planting three single suckers, as a rule, are placed in one hole, either close together or, better, to form a triangle six or nine inches long in the sides. Plant rather deeply, an inch or so under the level of the crown, and unless the canes are very fine indeed, it is better to cut them down to within six inches of the ground shortly after starting in the spring. This treatment concentrates the energy of the more thoroughly active roots into the production of fine bearing canes for the following season. In the case of specially strong canes, these might be left a foot or more long, or permitted to bear some fruit the first year.

Pruning, Training, and General Culture.—The Raspberry receives no pruning in the sense of that given to other trees. The pruning consists in the cutting out of the old wood down to the base of the stool, so soon as the fruit is gathered, and the thinning of the young canes in the growing season, to from three to five. Towards the late autumn these may also be topped, but this is by no means essential, and unless done in September or October, is better left intact till the spring, when the final shortening of the fruiting canes should take place. If done before winter, there is so much pith in Raspberry-canes that it is apt to get soaked with water, and this enables the frost and snow to split the canes, and thus do serious injury. The top of the canes is also a useful protection against severe weather.

The training consists in tying to stakes, turning or bending into arches, training over low arbours, and displaying at regular distances, over walls and espaliers, or improvised rails fixed against rough posts; bending the fruiting canes down to rails two feet or so from the ground, or, in a word, so disposing of the fruiting canes as to expose the fruits as fully as needful to light and air, and also allow the succession canes a fair field to develop their strength, without overcrowding or mixing with the fruiting canes. The early thinning of the succession canes, to the number likely to be wanted, prevents overcrowding. The training of the fruiting canes away from the line of succession ones, by means of a bar or rail, is also an excellent and simple means of doing justice to both sorts of canes.

Treatment of Double-bearing Raspberries.—Most varieties of Raspberries develop

more or less a tendency to bear twice. That is, the last year's canes carry a full crop, and some of those of the current year, also, show fruit late in the autumn. But the whole of both sorts of canes bear in the real double-bearing varieties: that is, the first in the usual way, and the other, or current year's shoots, in September or October. But as the first crop on these last-year canes *are seldom equal* to common Raspberries, a better mode is to cut all the canes level with the ground in the spring, as this forces the current year's canes of these varieties to come earlier, grow stronger, and produce a finer crop in the autumn.

An annual mulch with rich manure, frequent waterings of sewage, and keeping the surface free of weeds and of suckers not likely to be wanted for stock, and rather loose, complete the culture of the Raspberry.

Protecting the Ripe Fruit. — Birds and wasps, especially the former, are very fond of Raspberries, and means must be taken to keep them off or destroy them.

Varieties.—These, though gradually increasing in numbers, are not very numerous. The following are those selected by Mr. Carmichael:—

Wilson Junior Blackberries (*natural size*).

Select List of Raspberries.

Baumforth's Seedling—fruit large, of a deep red colour, and a very fine new variety.
Belle de Fontenay—fruit large, round, deep red, well flavoured. This is a good autumn-bearing kind. October.
Carter's Prolific—fruit large, very good flavour, a useful sort.
Fastolf—fair, medium size, good flavour, and great bearer.
October Yellow—fruit medium size, good flavour. October.
Semper Fidelis—fruit large, red, a vigorous grower and great bearer.
Vice-President—fruit large, deep red, well-flavoured.
Yellow Antwerp—fruit medium size, pale yellow, good flavour.

To these may be added—

Brinkle's Orange—far exceeding Baumforth's Seedling in the number of its suckers.
Cutbush's Prince of Wales.
October Red (Merveille de Quatre Saisons Rouge)—full-sized bright red fruit, September to December.
Red Antwerp.
Rivers' Large-fruited Monthly.

BLACKBERRIES.

There yet remains another class of Raspberries, or Blackberries, to be noticed. These, though known in England as Raspberries, obviously partake more of the character of Blackberries or Brambles.

The oldest and best known of these is the Black-cap, or American Black-rasp, or Thimbleberry of the Americans. It is really a distinct species of the *Rubus* or Bramble family, *R. occidentales*. It seems to have been cultivated in England under the name of the Bergemin Raspberry two centuries ago. It is almost black in colour, but is less sweet, and in most respects very inferior to our native species of Raspberry.

Many years ago, however, this species produced a much improved seedling, known as the Black Raspberry, a decided improvement on the old black. These two were employed in crossing the different varieties of Raspberries in cultivation by the late Mr. Thos. Rivers, of Sawbridgeworth, and thus originated the Autumn Black and other varieties that ripen in October. This is obviously a cross between the two species of *Rubus*, and the fruit have more the flavour of the Blackberry than the Raspberry. Of the same class, too, are the Ohio Everbearing, and New Rochelle or Lawton. The latter is most prolific, the fruit dense black, juicy, and highly flavoured—a Blackberry, however, rather than a Raspberry; though, as the narrow border-line has been passed between the two species, these hybrid Rasps must needs be mentioned here.

Several fine varieties of early-fruiting true *Blackberries* have recently been introduced from America, such as the Early Harvest, Dorchester, Wilson's Early, Pynder, Brunston's Early. But all these will probably be superseded by the Wilson Junior. This is an early Blackberry, ripening in the end of June in America, but much later in this country, where the sun has far less power. The berries are said to measure 4½ inches round lengthwise, and 3¾ inches crosswise, and one acre of plants to have yielded 120 bushels of full-sized fruit. The illustration on the preceding page shows the fruit of the natural size. A considerable amount of testimony is borne, not only to the size, but the sweetness of this improved Blackberry.

The culture of these monster Blackberries does not differ essentially from that of Raspberries. They are of freer growth and need more room. Plant in rows from five to eight feet asunder, and the plants from three to five feet apart in the rows. Vigorously thin out suckers in the spring, so as not to leave an excess to unduly crowd each other or overshadow the fruiting branches. Those who may hesitate to introduce Brambles into their gardens may easily plant them in out-of-the-way places, as where the common Blackberry now thrives these improved species or varieties will certainly succeed. Another good method of cultivation, much practised in America, is to tie the plants to rude trellises fixed about five feet apart.

Diseases and Insects.—In general terms the Raspberry may be said to be exempt from both. It is not subject to any disease. One grub, however, feeds on the flower-buds, another on the leaves, and yet another, or several, on the ripe fruit. For the checking or destruction of the Raspberry leaf miner, *Fœnusa pumila*, which eats out the centre of the leaf, there is nothing equal to picking off the infested leaves and burning them.

The grub in the bud of the Raspberry, *Tinea corticella*, can be subdued and destroyed by promptly squeezing every flower-bud that shows signs of withering, so soon as it appears to suffer. All such buds, for they are already useless, may also be picked off and promptly destroyed. But, as a rule, such insects do not appear to attack the Raspberries with sufficient force to do any real injury to the canes.

BULBOUS PLANTS.

By William Goldring.

Crocosma (Tritonia) aurea.—This is one of the most beautiful of the multitude of bulbous plants that have been introduced from the Cape, and is extremely valuable in the garden on account of its being hardy enough to be grown successfully in the open border in the South, as well as being suitable for pot-culture in the green-house or frame. Its value is enhanced, moreover, as it flowers during August in the South, and September in the North. It is a slender plant, about two feet high. The flower-stems overtop the foliage, are branched, and carry numerous open starry flowers of a bright orange-red, varying in size from two inches in the ordinary form to three inches in the variety *macrantha*. They open in succession, so that the plant is attractive for some weeks. It is of easy culture. In the open border the best soil for it is a light sandy loam, mixed with a little peat; and during active growth it is partial to moisture. The bulbs may be planted out during the latter part of April or beginning of May; if planted earlier the

young leaves are apt to be injured by the late frosts. Unless in very favoured spots it is best to lift the bulbs every autumn, say about the middle of November. At this season the new bulbs are not thoroughly ripe, therefore they should be potted in soil and placed in a light position under glass. The old bulbs may be separated in spring, and thrown away, retaining the large new bulbs for planting out in borders or potting for the green-house. When grown in pots, as it must be in the North, the bulbs may be potted in early spring. The pots may then be plunged up to their rims in ashes, under a cold frame, and should be liberally watered during summer, while in active growth. In August the plants will be in full bloom, and are then invaluable for the green-house. It should be always borne in mind that with this plant the practice of drying the bulbs is particularly harmful, and bulbs purchased in a dry state require some time to recover. It increases itself plentifully every season, and seeds may be obtained when the plants are flowered under glass, in a dry warm house. Seedlings flower in about three seasons.

Crocus.—Every one knows the common Dutch Crocuses, *C. vernus, aureus*, and others, that render our gardens so cheerful in early spring, but not every one is aware how numerous the wild species of the Crocus are, or how beautiful they are. Of late years, a few ardent lovers of bulbous plants have diligently searched the native homes of the Crocuses, the South of Europe and Asia Minor, in order to augment the list of species, until now there are just upon seventy distinct Crocuses, the majority being beautiful plants sufficiently hardy to be cultivated in the open air in this country. The Crocus is such a familiar flower that no description of it is needed. The same family likeness pervades the whole genus, and the members of it are so distinct as a class that there are no other genera, excepting perhaps such as *Colchicum* and *Bulbocodium*, with which they are likely to be confounded. The species differ from each other a good deal as regards stature and size of flower, and also colour, although there is not a wide range of tint in the genus, the prevailing colours being lilac, purple, orange, yellow, and white. There is a considerable difference between the species as regards the coating of the bulbs, or corms, as well as in the nature of the stigmas of the flowers. On the variation in these organs botanists have founded the classification of the species. For the most part the flowers of Crocuses are produced unaccompanied by leaves, as in the common *C. nudiflorus;* others, again, bear foliage at the same time as the flowers, as in *C. longiflorus*. From a garden standpoint it is convenient to class the Crocuses into two groups, viz., spring-flowering kinds and autumn-flowering kinds, as about half the cultivated species flower from August up till November, the other half from February to May, so that we may have a border devoted to spring flowers and another to those that flower in autumn.

As the Crocuses are natives of Europe and Asia Minor, all are tolerably hardy, the majority being sufficiently robust to withstand our climate quite unprotected, and some half a dozen species which have been in cultivation for generations have even become naturalised in some parts of England, and *C. nudiflorus* has even been considered a native in the Midland counties. The other common kinds are *C. vernus*, from the Italian Alps, which has been so long cultivated by the Dutch, and of which there are innumerable varieties; *C. aureus*, from South-east Europe, the well-known Dutch Yellow; *C. biflorus*, from Italy, the common Cloth of Silver or Scotch Crocus; *C. susianus*, the Cloth of Gold, also an Italian species; and less common, but well known, are *C. chrysanthus, versicolor, speciosus*, and *nudiflorus*. Beyond these, and their several varieties, the Crocuses are but little known in English gardens; but as they are so beautiful, and so easily grown, it is probable that, now they can be purchased from nurseries, they will become commoner. It is, therefore, advisable to give a list of the select kinds most desirable for general cultivation.

C. Alatavicus—a new species; already popular, as it is one of the earliest to bloom; flowers white, grained with purple; January. Worth growing under a frame. Ala Tau Mountains in Central Asia.

C. aureus—a very old Crocus; the parent of the Yellow or Dutch Crocus; commences to bloom in February; a variable species, among the varieties being lacteus (pale yellow, almost white), sulphureus, pallidus, and striatus. Europe and Asia Minor. Among the Dutch Yellow Crocuses, which seem to have sprung from C. aureus, those named Barrs' Golden Yellow, Louis d'Or, and Superb are very fine sorts.

C. banaticus—one of the showiest of Crocuses. The flowers are large and of a deep rich purple. February and March.

C. biflorus, of which the common Scotch or Cloth of Silver Crocus is a larger variety, is an early spring flowerer, and one of the best known. Its flowers vary from white to pale lavender, and are always striped with black outside, except in a variety called estriatus. One of the best to plant in masses, and naturalise in woodlands or the wild garden. Weldeni, a similar species, smaller, with prettily freckled flowers.

C. Boryi has white flowers, with bright orange throat. It is an autumn flowerer, generally at its best in October, and, being a little tender, is best in a frame.

C. cancellatus—one of the best autumn Crocuses; flowers large, varying in colour from white to purple; a strong grower, and rarely fails anywhere.

C. chrysanthus—a common spring yellow kind; is valuable, as it flowers so early, often in the end of January. It is smaller than C. aureus, and, like it, has several varieties, those named albidus, fuscotinctus, and fusco-lineatus being the most distinct; succeeds well in the open border. Olivieri is also yellow but smaller.

C. Imperati—generally considered the most beautiful Crocus in cultivation; is one of the earliest spring flowers; sometimes blossoms in midwinter, but usually from the end of January to March. The flowers are large,

with the three outer sepals tinted with fawn-colour, and feathered with deep purple, while the inner sepals are of a clear deep lilac.

C. iridiflorus—a beautiful autumn species, distinct from others in having the three inner sepals of the flower much smaller than the three outer; flowers bright purple and very showy, during September and October; also known and sold as C. Byzantinus.

G. longiflorus—a desirable autumn flowerer, having light purple flowers, and, with C. lævigatus, blooms in October. The flowers of the latter vary from white to lilac.

C. medius has large, rich purple flowers, and being a vigorous grower, flowers well unprotected during October.

C. nudiflorus has become naturalised in some parts of the Midland counties; an autumn flowerer, producing large blue-purple flowers, without leaves, in September.

C. ochroleucus—an autumn bloomer; flowers white and yellow; deserves frame protection.

C. pulchellus is a pretty little species, with pale lavender flowers, produced in autumn, and hardy enough for the open border.

C. serotinus and its near ally, C. Salzmanni, both handsome kinds, produce bright lilac flowers in autumn, with foliage, generally about October. C. Clusii, also an autumn flowerer, is similar.

C. Sieberi, a spring flowerer, beginning to bloom about February; is small in growth, but attractive, being bright lilac.

C. speciosus—one of the finest of all Crocuses; has flowers quite three inches across when open, and of a deep purple, prettily netted; an old garden bulb, very hardy, and easily grown; generally begins to bloom about September, and continues for two or three weeks.

C. suaveolens and minimus—both similar to Imperati but smaller, and under the same head may be classed such rare species as C. etruscus.

C. susianus—the common Cloth of Gold Crocus; has bright orange flowers, stained with bronze on the exterior. C. stellaris is similar and equally beautiful, and one of the commonest, being amongst what are called Dutch Crocuses.

C. vernus—the Spring Crocus, a common species in Central and Southern Europe—is the parent of the innumerable varieties of purple spring Crocuses which are imported so largely from the Dutch bulb gardens. In its simple state *C. vernus* is a beautiful plant, having large and handsomely formed flowers of a purple hue. It may easily be distinguished from other species by the large obovate flowers, and by a distinct ring of hairs in the tube of the flower. It has been under cultivation for centuries, and was one of the earliest bulbs that engaged the attention of the famous Dutch bulb-growers. They have so improved it and varied it so much in colour, that every conceivable shade between pure white and deep purple is represented, and, in most cases, the flowers are prettily feathered and netted. The most noted sorts are those named David Rizzio, deep purple; Baron von Brunon, large dark purple; Prince Albert; Mrs. Beecher Stowe, pure white; Sir Walter Scott, one of the best, beautifully netted; Vulcan, purple-lilac; Pride of Albion, white striped with lilac. *C. vernus* is one of the best of all the Crocuses for forcing into flower early in pots, and for this purpose they are imported every year, usually about August, from the Dutch bulb farms, by the million. In all cases, the largest and plumpest corms or bulbs should be selected for forcing, as so much depends upon the inherent strength of the bulb to yield a good crop of bloom. One bulb produces as many as a dozen blooms, which open in succession.

C. versicolor has flowers varying from white to purple, prettily striped and pencilled; a hardy and vigorous grower.

C. zonatus is very ornamental, and flowers in September; flowers a bright lilac, with a golden centre.

Culture.—Those who aim at forming as complete a collection of Crocuses as they can, will doubtless find means of obtaining all the information about the respective kinds that is available, therefore it is not necessary here to enter into the details of the peculiarities of every species, but only to give a few hints as to the management of a collection of the commoner and more robust kinds, and especially those that may be grown in the open air. These will include those that flower in the earlier part of the autumn, and from February onwards. Those that flower from the end of October to February really require some sort of protection, such as a hand-light, frame, or brick-pit, and as these are all inexpensive appliances, many cultivators may like to grow the species that flower during winter. All Crocuses delight in a deep sandy loamy soil, well drained and fully exposed to the sun, but screened from the north and east. Where many kinds are grown in one border, it is convenient, in order to keep the kinds distinct, to place pieces of slate or tile between them, so as to reduce the chances of intermixing the bulbs. In an ordinary way, however, they may be planted along the margins of hardy plant borders, intermixed with other kinds of bulbs, or, indeed, any other plants, so long as they are not too strong in growth to smother the Crocuses. After the foliage of Crocuses has decayed, about June, nothing is seen of them until the autumn-flowering kinds begin to push up their flowers. It is advisable to lift the bulbs now and again, say about every second or third year, the stock may then be increased by separating the offsets; but in all cases the bulbs should not be kept out of the ground long, or they will shrivel and, therefore, be weakened.

The time to lift Crocus bulbs may be best judged by the condition of the foliage. As soon as this has turned yellow, and apparently dead, the bulbs are then inactive and may be lifted. They should first of all be cleaned, and the small corms separated from the large ones, and all should then be kept in pots of dry soil or sand in a cool place, such as on the shelf of the garden shed. About the end of August every bulb should be re-planted, otherwise the autumn flowerers will not have formed roots sufficient to sustain the bulbs while flowering.

It is always best to grow Crocuses and other small bulbs in certain open warm spots where other plants would be the least disturbed by this lifting and plant-

ing. Indeed, it is a good plan to have separate borders, keeping the spring and autumn flowers separate. The bulbs may be better managed by so doing, and the flowers always look better when in masses. The bulbs should be planted rather deeply, so as to be beyond the reach of frost, for deep planting is essential to Crocuses, because the new bulbs are formed on the top of the others, so that each succeeding generation comes nearer and nearer to the surface if allowed to remain undisturbed.

There are two enemies to border Crocuses. These are mice and sparrows; the former attacking the bulbs, the latter the flowers, particularly those of a yellow colour. The only remedy in case of the mice is to trap them; and sparrows may be kept in check by stretching a few lines above the Crocus blooms; this will frighten the birds and keep them away.

Propagation of Crocuses is so rapid, by means of the bulblets, which are formed upon or by the side of the parent bulbs, that it is scarcely worth the trouble to raise seedlings, although this may be done. The power of propagation by offsets varies in the different species, one of the most prolific being the common Spring Crocus (*C. vernus*).

Pot-culture of Crocuses is usually practised only in forcing the common spring kinds into flower, and for the more rare and delicate species which, if grown in frames with the pots plunged in ashes, can receive more attention than when planted in the borders. Although it is such a common practice to force Crocuses, they, like Snowdrops, cannot be forced into bloom easily so early as Tulips and other spring bulbs, and rarely do the flowers develop well before February, that is, a few weeks before they naturally flower in the open air. The bulbs, as a rule, come from Holland with the other kinds of Dutch bulbs, and may be purchased from the beginning of September onwards. As soon as received they should be potted in good loamy soil, about six or eight bulbs in a six-inch pot, which should be well drained. The bulbs should be put about an inch below the surface. The pots should then be plunged to the rim in ashes, in a frame or where they may be protected from frost, and it is a good plan to place either about an inch or so of ashes or a layer of moss over the pots; the whole should then be watered and kept moist, but not too wet so as to injure the bulbs. About the beginning of February a few of the pots should be taken into the green-house or pit, provided it is not too warm, and placed on a light shelf. The flowers will soon appear, and, by introducing the pots a few at a time to the house, a succession of bloom may be had, the best crop being about the middle of March.

Cumingia trimaculata.—A beautiful Chilian plant belonging to the Lily family. Its leaves are grassy, and the flower-stem, which grows from a foot to a foot and a half high, is much branched and bears numerous beautiful blue flowers having a deep violet spot at the base of three interior sepals. It is regarded as a variety of *C. campanulata*, a plant probably not in cultivation, and which has smaller flowers wholly blue, while *tenella*, another variety of it, is characterised by its more slender growth. This plant must either be cultivated in pots in a green-house or frame, for though tolerably hardy it is in active growth during our winter, when frosts and rains, if the plants were exposed, would injure them. It is so beautiful that it is worth a great deal of attention. It may be obtained at some of the London nurseries.

Cyanella.—The commonest species, *C. Capensis*, also called *C. cœrulea*, is a little plant, growing about a foot high. It has small Crocus-like bulbs, and narrow, rigid leaves, and produces slender-branched flower-spikes, bearing numerous small blue flowers. *C. lutea* is similar, having yellow flowers, both being natives of South Africa, and requiring green-house and frame culture, with treatment as that given for Cape bulbs in general.

Cyclobothra.—A section of the genus *Calochortus*, including those species having the petals of the flowers deeply pitted at the base of their inner surfaces, and curved inwards, so as to give the flowers a more or less globular form. The species of *Calochortus* which were formerly known as *Cyclobothras*, and are still catalogued as such, include *C. albus*, *cœruleus*, *elegans*, *Hartwegi*, *purpureus*, and *pulchellus*. These are all described here under *Calochortus*.

Cypella. — Iridaceous plants, similar to the Tiger-flower (*Tigridia*), and their flowers so much resemble those of that genus, that *C. Herberti* is also known under the name of *Tigridia* as well as *Marica* and *Moræa*. Its flowers are curiously shaped, of a buff-orange tint, beautifully marked in the centre with reddish-brown. It may be grown successfully in frames or cool green-houses, as Ixias are. The bulbs require to be planted or potted in autumn, and the young growths protected from frosts during winter. In spring the growth should be encouraged, as this will induce fine flowers, which appear in early summer. *C. Peruviana* is an extremely handsome plant, resembling the Tiger flower, but has a rather more slender flower-stem. The flowers, borne two or three on a stem, are about three inches across. They are like those of *Tigridia* in form, bright golden-yellow, heavily barred and spotted in the middle with reddish-brown. Though each flower does not last longer than a day, it is

followed next day by another, and so on until all the buds are expanded. Being a Peruvian plant it requires a warmer treatment than *C. Herberti*. *C. gracilis*, a pretty plant, is rare.

Cyrtanthus. — This genus of South African bulbs has not come under general cultivation in this country, although some of the species comprising it are extremely pretty, and particularly valuable during the winter season for supplying cut bloom, as it is then they habitually flower. There are some fifteen species in the genus, but only about half a dozen are in cultivation. The introduced kinds all require green-house culture, some being evergreen, the rest deciduous. Those which retain their leaves always are the most difficult to grow well, as their resting period is not so plainly indicated as in the case of those that lose their leaves as soon as the bulbs are ripened. Any ordinary light potting soil suits them, and the general directions given for green-house bulbs are applicable to them. All are small-growing plants, having narrow grassy foliage, and bearing their flowers in umbel-like clusters on the top of slender stems, which generally overtop the foliage. The flowers are tubular and usually long and drooping, varying in colour from white to red and yellow. They have no definite flowering season, but most of them bloom during winter and spring, when, of course, their blooms are most appreciated, especially as they are so enduring when cut and placed in water. The following are the principal species in gardens, all of which are well worthy of culture :—*C. Mackenii* is probably the most beautiful of all, the flowers being pure white ; *C. carneus*, pale red ; *C. obliquus*, orange-yellow ; *C. lutescens*, yellowish-white ; and in *C. odorus* they are red and fragrant.

Drimia.—Cape of Good Hope plants allied to *Scilla*, but not worth general cultivation. The same remark applies to the genus *Drimiopsis*.

Elisena longipetala. — A handsome plant, a native of the Andes, and belonging to the Amaryllis family. Its bulbs are long and cylindrical, producing flower-stems from two to three feet high, terminated by clusters of about half a dozen flowers each. These are large, having very long white sepals, and a large cylindrical curved corona, also white. It is deciduous, and requires the same treatment as recommended for warm green-house bulbs. There are two or three others, but this is the commonest.

Erythronium (*Dog's-tooth Violet*).—These are among the prettiest of the hardy bulbs, extremely elegant and very easily grown. The commonest kind, *E. dens-canis*, has been a favourite in English gardens from time immemorial, having been grown long before Gerarde's time, upwards of three centuries ago. Still we have it as our forefathers grew it, unchanged, except perhaps we have one or two additional varieties. Any one who knows this old garden plant would at once recognise the other members of the genus, as there are certain characters common to all the species. They are all of dwarf growth, the largest being not more than a foot high. All have lanceolate leaves, more or less broad, and generally mottled with a dark hue. The flowers of all the species are turban-shaped, and range from pure white to rosy-pink and yellow. As a rule, the flowers are borne singly on slender erect stems, but in some species, as *E. grandiflorum*, they are borne several together on each stem.

The genus is not a large one, numbering only about a dozen species and varieties, and nearly all of these are grown at present in English gardens. For such a small genus its geographical distribution is very wide. It has its representatives as far east as Japan, others are found in Europe, but the headquarters of the genus is in Western North America, chiefly in California ; only two, *E. albidum* and *Americanum*, being found in the Eastern States. The following list includes the principal species and varieties.

E. Americanum (Yellow Adder's-tongue).—This is a pretty American species, common in the low copses in the Eastern United States. It is very dwarf, with the leaves heavily mottled. The flowers are smaller than those of the common *E. dens-canis*, of a bright canary-yellow, borne singly on stalks about six inches high. It flowers in May. It is by no means a common plant in this country, being the most difficult to manage of all the Dog's-tooth Violets. Those who have been most successful with it are of the opinion that it requires to be grown where its roots may be confined, in order to flower it well. Therefore, it is best to grow it in pots with the bottoms out and plunged into the soil, or planted in a stone pocket-like compartment in the rock-garden. In requires a partially shady spot, in light peaty soil, and as its bulbs dislike disturbance, it should be allowed to remain for years in one spot. It is such a pretty plant that it is quite worth a little extra trouble. It is also known under the names of *E. Nuttallianum*, *E. lanceolatum*, and *E. flavum*. A variety of it is named *E. bracteatum*, but is not in gardens. There are two allied species, also natives of the Eastern States, named *E. albidum* and *E. propullans*. These are both similar to *E. dens-canis*, but inferior in beauty. They have flowers about an inch and a half across; bluish-white in *albidum*, rose-pink in *propullans*. The foliage of both of these species is unmottled.

E. dens-canis (European Dog's-tooth Violet). — This beautiful little plant is quite indispensable to any garden, large or small, for much of the beauty of the open border in early April is owing to the numerous varieties of this charming flower. It is so common, there is little need to describe it. It differs from the rest of the Dog's-tooth Violets on account of its oval leaves being most beautifully blotched and mottled with emerald-green and a bronzy hue. It is dwarf in growth, rarely rising above six inches high. The flowers droop gracefully upon slender stalks, and vary in colour from a deep rose-pink to white. The chief named varieties are *purpureum majus*, the largest-flowered deep-tinted kind, inclined to purple, *roseum* and *roseum majus*, *album* and *album majus*, names expressive of their distinctive colours. There is a distinct variety called *longifolium*, which has been in gardens for centuries. It is recognised by its longer and less spotted leaves, and larger flowers. The geographical varieties, *Sibiricum*, found in Siberia, and *Japonicum*, a native of Japan, are scarcely worth the general cultivator's attention, seeing that both are inferior to the ordinary European form. *E. dens-canis* is an easily-grown plant, thriving best in an open sunny border, in a sheltered spot, so that the delicate blooms are not exposed to the harsh winds of March and April. The best soil is a moist sandy loam, and it is partial to a little peat in cold districts.

E. giganteum is the noblest plant in the genus. It is a native of Washington Territory and Vancouver's Island, but, notwithstanding this, it is quite hardy in this country. It is such a distinct plant from the rest that no one can mistake it. The foliage is slightly mottled, and flowers are produced solitary, on stalks from six inches to nine inches high. They are about four inches across, with reflexed sepals; pure white with a ring of red in the centre. It is often confused with the yellow *E. grandiflorum*, but as the latter always bears more than one flower on a stem, it may be distinguished by this character alone. *E. giganteum* is a rare plant, so that not much is known of its culture, but it seems to thrive admirably in company with other American species in a peaty soil. It is also called *E. maximum*, *E. speciosum*, and *E. grandiflorum*, var. *albiflorum*.

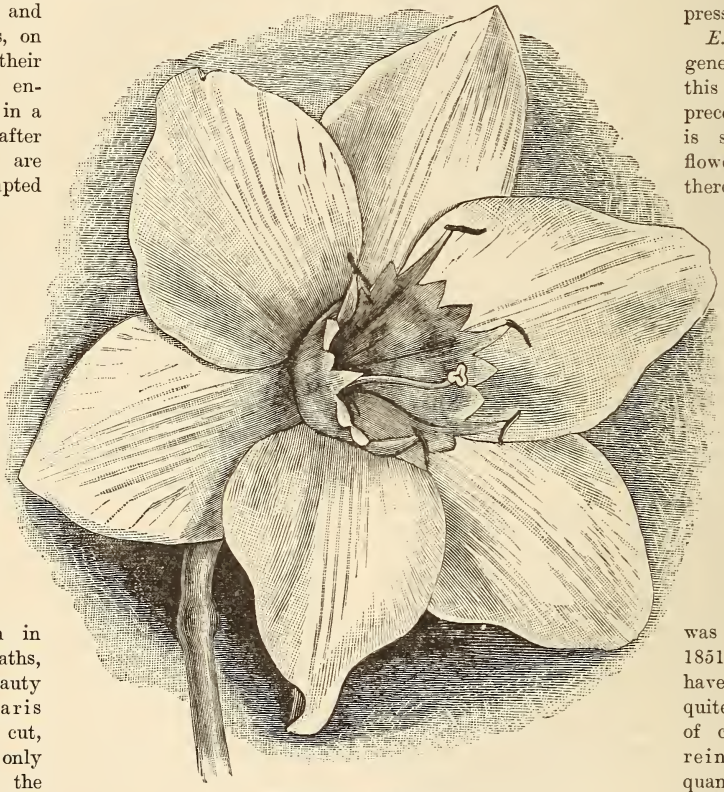
E. grandiflorum is distinct from all the other cultivated Dog's-tooth Violets, on account of its having, when fully developed, more than one flower on each stem, there being sometimes as many as five or six, though in weak bulbs there is frequently but one. They are about two inches across, of a soft primrose-yellow, with a central ring of red. It is very handsome, and as it is such a free-flowering plant, it produces a fine effect in the border. It often grows over a foot in height in moist peaty soils, in shady spots, and continues to expand its flowers for several weeks during April and May.

E. purpurascens is a rare Californian species, having several flowers on each stem; light yellow, tinged with purple. *E. revolutum* is regarded either as a synonym or a slight variety of *E. purpurascens*, and somewhat similar is *E. Hartwegi*, also unknown in cultivation.

Culture.—As a general rule, the American Dog's-tooth Violets may be looked upon as shade and peat lovers, while the European *dens-canis* delights in an open sunny border of light loam soil, though it does not object to peat and shade. It is always advisable to choose a spot where the plants would be sheltered from cold northerly and easterly winds, which soon spoil the flowers. The bulbs—which, by the way, are long and slender (hence the name Dog's-tooth Violet)—should be planted some two inches deep, and when once the plants are thoroughly established and appear to be thriving, they should not be disturbed, except for the sake of increasing the stock, which may be done by lifting the bulbs about midsummer, separating the bulblets, and re-planting the parent bulbs immediately in fresh soil; the bulblets, if planted at once in a suitable spot, will soon grow into a flowering size. Seeds are produced also; but as this is a slow way of propagation, it is not often followed. A sunny sloping bank affords a capital position for planting the *dens-canis*, even if the bank is covered with grass, and for any part of the rock-garden there is no prettier plant to be found. The American species are not so hardy and vigorous as the European species, therefore require a little more attention. As a prevention against frost the bulbs should be planted about three inches deep. A partially shaded nook suits them best, screened from the cold winds, but they should be planted sufficiently away from large trees, otherwise these would draw away from the peat bed the moisture which is so essential to them. They may be increased in a similar manner to the common kind, and like it, they must not be left out of the ground long. The American species usually flower about the latter end of April and the beginning of May, therefore are a few weeks later than *E. dens-canis*. Their flowers are well adapted for cutting, as they endure a considerable time in water.

Eucharis.—In every garden containing a hothouse the Eucharises are quite indispensable. No other flowers surpass them in loveliness, being of snowy whiteness, of wax-like texture, exquisite in form, and borne in an elegant way in drooping clusters, on sturdy, erect stems rising from a mass of luxuriant foliage. The Eucharises are all the more

valuable inasmuch as they produce flowers in the depth of winter as well as in the height of summer. In recent years the older kind of the three in cultivation has become one of the commonest of stove plants, and, moreover, is largely grown in market flower gardens, the perennial yield of flowers making it a most profitable plant to grow. No bridal bouquet or funeral wreath is now considered perfect unless it contains the Eucharis, and as the flowers, on account of their firm texture, endure so long in a fresh state after cutting, they are specially adapted for these purposes. As the blooms open one by one in the clusters, it is not usual to cut the whole spike, but merely the expanded blooms, which have stalks two or three inches long, quite sufficient for arranging them in bouquets, wreaths, &c. The true beauty of the Eucharis flowers when cut, however, can only be seen when the whole spike is cut and placed in water. It is then most interesting to see the beautiful way in which the flower-buds unfold one after the other. To really enjoy the Eucharis, therefore, the spikes must be cut and placed in a simple vase, and arranged with a few of its own leaves. There are three species of Eucharis grown in gardens. Of these the commonest and best known is



Eucharis Amazonica.

E. Amazonica.—This is the finest of the three, and is so generally cultivated that it scarcely needs description. When well grown its flowers are as much as four inches across, and good spikes bear as many as eight, nine, and ten flowers in an umbel-like cluster on stems ranging from eighteen inches to three feet high. The foliage is handsome, being broad and of a deep green. The most abundant crops of flowers are produced during the spring months, but intermittent crops appear throughout the year. This plant was first brought to Europe from New Grenada in 1854. Its correct name is *E. grandiflora*, but it is so commonly known in gardens as *E. Amazonica* that it is doubtful if this name will now be suppressed.

E. candida. — In general appearance this resembles the preceding kind, but is smaller in its flowers, and may therefore be used for purposes for which *E. Amazonica* would be too large. Though extremely graceful, it is not so free-flowering as the larger kind, and it needs a much longer period of rest after blooming. This species was discovered in 1851, but seems to have almost, if not quite, dropped out of cultivation till reintroduced in quantity about ten years ago, since which time great numbers have been received. There is a spurious *E. candida* in cultivation, having small and comparatively inconspicuous white flowers of quite a different shape. It is not really a Eucharis, but a Calliphruria.

E. Sanderiana.—This is the latest addition to the genus, having been only introduced in 1882. The leaves are more wrinkled and of a paler green, particularly in their young state. They are, moreover, much broader and more heart-shaped. The flowers are arranged in an umbel on a stout stem, as in the preceding kinds, but their shape is different, the tube being more funnel-like, and the segments do not

reflex. Another striking feature is that the corona, or crown in the centre of the flower, so conspicuous in the other two kinds, is far less so in this, as it projects but slightly beyond the tube. Except for a few faint streaks of yellow in the centre, the flower is pure white. *E. Mastersiana* is a new and similar species.

Culture.—Being natives of the warm parts of New Grenada, all the Eucharises require the heat of a stove-house to grow them successfully, though they can be grown satisfactorily in a close greenhouse with attention. The best soil for them is a mixture composed of good fibry loam, a little sharp sand, and decayed cow-manure. The pots must not be over-large; six full-sized bulbs, for instance, should occupy a nine and a half inch pot, and more or less in proportionately larger or smaller pots. Good drainage must always be given, for though the plants like an abundant supply of water, a sodden soil soon injures them. Some growers plunge their Eucharises in a brisk bottom heat, so as to get the plants into flower in rapid succession in winter, but such a stimulus tends to weaken the bulbs, and render them subject to what is called the "Eucharis disease." This really appears to be not a functional disorder, but one brought about by a little insect called the Eucharis Mite (*Rhizoglyphus echinopus*), which attacks the bulb, sucking its juices, therefore endangering the life of the plant. A sickly growth, pale green or yellow leaves, are indications that this insect pest is infesting the bulbs, although these symptoms are sometimes the result of bad drainage and other causes. The Eucharis, therefore, can easily be over-stimulated by excessive heat and manures, and to both of these evils it has unfortunately been subjected in the eagerness, on the part of cultivators, to produce as large crops of bloom as possible from the plants without giving them a fair period of rest. A moderate heat and a judicious application of highly concentrated manures, whether solid or liquid, is therefore the secret of good Eucharis culture. As all the species are evergreen plants, they must not be dried after blooming, though they should be kept somewhat drier till growth recommences vigorously, but at no period must they be allowed to become quite dry. In the case of imported bulbs that arrive in a dormant state, they should be put in pots as small as possible, and watered only enough to maintain a slight moisture in the soil till the young leaves make their appearance. When the pots are full of roots, and the plants in vigorous growth, an occasional supply of weak manure-water may be given, and this is preferable to re-potting too often. Propagated by offsets taken off at the time of potting, or by seed—the latter a slow process.

Eucomis.—The few species of this genus in gardens strongly resemble each other, and as none are showy, they are unimportant, though interesting on account of being unlike any other bulbous plants. They all produce tufts of broad recurving foliage and erect flower-stems, densely set with greenish-white blossoms so as to form a cylindrical spike. They differ chiefly in stature, *E. nana* and *E. regia* being the dwarfest, *E. undulata* and *E. punctata* the tallest. All are natives of the Cape of Good Hope, and have proved sufficiently hardy to withstand our ordinary winters in the Southern districts, if their bulbs are slightly protected by a mulching. Any ordinary garden soil suits them, if light and warm.

Eurycles.—The three plants representing this genus of the Amaryllis family in gardens, bear a good deal of resemblance to the Eucharises both in growth and flowers, and are all very handsome plants. All three are in cultivation, but are rare, though they are such old inhabitants in gardens. Being natives of the warm South Sea Islands and Western Australia, they require a warm green-house culture, but are not difficult to manage if accorded the same treatment as that recommended for similar plants, such as Eucharis. After the growth is ripened, the bulbs require to be rested by being kept dry until signs of new growth are evident. In the meantime the bulbs should be re-potted. The three species are :—

E. Amboinensis — the Amboyna Lily—is the finest of the three species; bears large heart-shaped, pale green leaves, ribbed on the surface. The flower-stems are stout and erect, and carry a large dense cluster of white flowers some two or three inches across, but scentless.

E. Australasica—the Brisbane Lily—is similar, but smaller, the leaves being less heart-shaped, and the flowers fewer. They are pure white as in the Amboyna Lily. It is the commonest in cultivation.

E. Cunninghamii is different from the others, as the leaves are not heart-shaped. The flower-stems, about a foot high, bear heads of from four to ten white flowers. Native of the Brisbane River.

Ferraria undulata.—A quaint-looking dwarf-growing plant with Iris-like leaves, and flowers like those of the Tigridia, but small and of a dull plum-colour. It is a native of South Africa, but hardy enough to be grown out of doors in warm localities if the bulbs are protected in winter, but is scarcely worth the trouble of pot-culture.

Freesia.—The rich flora of the Cape of Good Hope has yielded to us no lovelier or sweeter-scented bulbous plants than the Freesias, which have rapidly risen in public favour within the past few years. The species comprising the genus are very few, probably only two, and are peculiarly distinct from any other members of the Iris family. These two kinds bear such a strong resemblance to each

other that it is often difficult to distinguish them. Both species in cultivation have narrow grassy foliage, and bear slender flower-spikes generally about a foot in height, but attaining two feet under the most favourable conditions. The flowers are long and tubular, with the sepals spreading an inch or more across. They are always borne on the top of the spike, arranged in a horizontal row, ranging from four to twelve on each spike, and opening in quick succession. The commonest species is *F. refracta*. This has pale yellow flowers blotched interiorly with orange and purple. The white variety of this (*F. refracta alba*) is the loveliest of all and the most popular, inasmuch as its flowers are purest white, save two blotches of delicate orange-yellow on the lower sepals. *F. refracta* has been called by several names in books, but the principal synonym in gardens is *F. odorata*—an appropriate name, as the flowers are delightfully scented, the perfume being similar to that of Violets. The other species is named *F. Leichtlinii*, the flowers of which are yellow and smaller than those of *F. refracta*, and much inferior. The Freesias are peculiarly well adapted for cutting, their long and slender flower-stems being very elegant in vases. Moreover the flowers endure a long time in water in good condition, and if cut in a bud state the flowers expand in succession.

Culture.—Though Freesias are not really hardy, they may be grown successfully in the open air during summer in the warmer parts in the South of England, provided the border is sunny, well drained and sheltered, and the soil is light. Green-house or frame culture is, however, most satisfactory, and their culture in pots is simple and easily managed. The bulbs may be potted in autumn, about half a dozen in a pot four and a half inches across, in a mixture of loam, peat, and a little manure. The pots may be placed in a cool frame where frost is excluded, or on a conservatory or green-house shelf, but care must be taken not to water the bulbs much till they show signs of growth. When leaves appear, and the plants are in active growth, a liberal supply of water may be given. Autumn-potted bulbs will begin to flower about the latter part of January, and continue in flower for some three or four weeks. By potting at intervals in autumn and early winter a succession of flowering plants may be had. Some grow their Freesias in stoves and obtain flowers by Christmas-time, but the bulbs so treated are weakened by the heat and moisture. It has now been proved that Freesias can be really treated like annuals, that is, seedlings may be had in flower within a year from the time of sowing. This is a quick process, and requires some skill and attention, but it is easy to raise plants from seed so as to flower in the second season The seed must be sown as soon as ripe—that is, about midsummer. The seedlings will soon appear, and if these are carefully attended to during the ensuing year, they will eventually make strong flowering bulbs by the following spring.

Fritillaria (*Fritillary*).—There are a great many Fritillaries in gardens, but they are not all of equal merit. Some, such as the common Crown Imperial (*F. imperialis*), are amongst the handsomest hardy plants in gardens, while some are scarcely worth consideration, so unattractive are their flowers. The larger number, unfortunately, are only to be recommended to those who desire to make a speciality of bulbous plants. The genus is essentially a Northern one, but is very widely dispersed, for while its head-quarters are in Europe and Asia Minor, it has outlying species in the Himalayas and Japan in the East, and in California in the West. With the exception of these extreme Eastern and Western species all are quite hardy, and may be successfully grown unprotected, and with very little attention, in the open border; indeed, the majority of the Fritillaries seem to thrive best under neglect. It is only the Californian species, such as *F. recurva*, *pudica*, and others, that present any difficulties in their culture. No garden is furnished without the Crown Imperial, of which there are now a great many varieties, and equally valuable are the varieties of the Snake's-head Lily (*F. Meleagris*), our native species, and *F. latifolia*. All these are quite capable of taking care of themselves if left entirely to nature, and there can be no prettier sight than to see noble groups of Crown Imperial naturalised, or colonies of the Snake's-head Lily and its allies. Of the fifty odd kinds known, the majority of which are in gardens, the following is a selection:—

F. Delphinensis.—The original form of this species is not a showy plant, but the varieties of it, particularly those named *lutea*, *Moggridgei*, and *Burnati*, are all very handsome. In the variety *lutea*, the large nodding flowers are yellow, chequered with brown; but in *Moggridgei*, the flowers are larger and of a golden-yellow, spotted and speckled with brown. It is, moreover, much dwarfer in growth than the type. Similar, but distinct in colour, is the variety *Burnati*, with beautifully-shaped bell-like flowers, of a rich reddish-brown colour, chequered with a deeper tint. These varieties are very desirable plants to grow. As they flower in early spring, they should be planted in warm sunny borders of light soil.

F. imperialis (Crown Imperial).—This is the most important plant in the genus. It is so common that it hardly needs description. When well grown its stout stems are as much as four feet in height, and

these, when bearing on their tops crowded clusters of drooping bells, surrounded by a crown of foliage, are unrivalled for stateliness throughout the whole range of bulbous plants. The Crown Imperial is not fastidious as to soil; light or heavy are alike suitable to it, but it has a preference for a deep sandy loam, well enriched by manure. In such a soil it attains its fullest development, and goes on increasing itself year after year with rapidity. It looks well in any position, but nowhere better than when a group of it nestles in a shrubbery nook, and then its flowers backed by greenery are seen to the best advantage; besides, it is partial to a little shade. The only bad treatment the Crown Imperial dislikes is that common among nurserymen of leaving its bulbs out of the ground too long. It is this that weakens them and induces decay. The great fleshy bulbs have but a very short resting period, for no sooner is the current year's growth perfected and ripened than the bulbs begin to send out new roots in order to gain strength for the support of the following season's growth. Therefore, it is necessary to buy Crown Imperials as early in the season as possible—say about August—and no time should be lost in re-planting them where they are intended to remain. When once well established the bulbs should not be transplanted for years. The ill-success with this noble plant may often be attributed to disturbing the bulbs. Neither should the stems be cut off; they should be allowed to decay and die down of themselves. A hot summer greatly benefits Crown Imperials, as the bulbs are ripened better, and a fine yield of bloom invariably follows. There are now many named varieties, the best being the following:—Aurora, a fine yellow; the double yellow (*lutea plena*); double red (*rubra plena*); *rubra maxima*, one of the finest, the flowers being a bright Venetian red, and larger than usual. *Maxima lutea*, the large yellow, is a companion variety to *rubra maxima;* Orange Crown, orange-red; Crown upon Crown, a peculiar variety, having two heads of flowers, one tier being above the other; Sulphurine, bright orange-yellow, and Slagzwaard, a kind with flattened (fasciated) stems and deep red flowers. There are also several variegated-leaved kinds, the principal of which are—*aureo-marginata*, gold-edged leaves; *argenteo-variegata*, silver-striped leaves; William III., white-edged leaves. These variegated sorts produce a fine effect by their foliage, but their flowers are rarely so fine as the others. These are the best among the numerous sorts in English and Dutch gardens.

F. Kamtchatcensis.—This, the Sarana Lily, is distinct from all other Fritillaries, its flowers being almost black. Its stems rise from six to eighteen inches high, terminated by from one to three bell-shaped flowers, about an inch across. It is a very hardy plant, and strong enough to be grown without protection. It thrives admirably on a well-drained and sheltered rockery. It is known also as Lilium. Similar to this species, but taller, and more floriferous, are *F. tristis* and *Græca*, both of which have very deep purple, almost black flowers.

F. latifolia.—This is similar to the Snake's-head (*F. Meleagris*), but may be distinguished at a glance by its much broader leaves and larger flowers, and altogether more sturdy growth. It, moreover, flowers fully a fortnight earlier than the *Meleagris* varieties. The Dutch bulb-growers, though they class the two sets of varieties together, distinguish them by broad-leaved early flowerers, and narrow-leaved late flowerers. The growth of *latifolia* ranges from six to twelve inches high, and each stem bears one or more flowers, varying in the different kinds, in all shades of purple, lilac, yellow, and almost black. They grow vigorously in any ordinary garden soil, either in sun or shade, but best exposed, and when planted in masses are capable of producing some extremely pretty effects during May. There are about a score of varieties now in cultivation, the best of which are those named:—Adam Smith, Black Knight (with almost black flowers), Captain Marryat, Caroline Chisholm, Cooper, Dandy, Jerome Howard, Marianne, Maria Goldsmith, Pharaoh, Rembrandt, Shakespeare, and Van Speyk. In these will be found a wide range of subtle colours, none of them very brilliant, though pleasing.

F. macrophylla.—A handsome species from the Himalayas, known also as *Lilium Thompsonianum*. It produces pink flowers on stems about a foot high. It is not thoroughly hardy and requires frame or cold green-house culture. It thrives better planted out than in pots, and a bulb will sometimes grow for three or four seasons without flowering.

F. Meleagris (Snake's-head).—Though this plant is a native, it is not common in gardens, particularly the varieties of it. These number about half a dozen, and are named *alba*, white; *pallida*, light purple; *nigra*, almost black; *purpurea*, deep purple; *angustifolia*, long narrow leaves and violet-purple flowers; *Agathe* and *Clochette*. In these, except in the white varieties, the flowers have the handsome chequered markings peculiar to the Fritillaries, very pronounced. The plant is altogether more slender and more graceful than *F. latifolia*, and when seen in little groups in sunny borders, the various kinds are pretty. They thrive in any ordinary good garden soil, and are quite amenable to forcing into flower early. When grown in pots, the soil in this case should be very sandy and enriched by leaf-mould. The forcing must be gently carried out,

otherwise no flowers will be produced. Forced Snake's-head flowers may be had as early as March with care. The bulbs of this species, as well as those of most other Fritillaries, keep best in sand during the time they are out of the ground, but this should be as short as possible.

F. pudica.—This little Californian plant is quite hardy, but owing to the absence of certain conditions, such as a protracted dry period in this country, it cannot be left to take care of itself in the open border. It is therefore best to grow it under the same treatment as that recommended below for *F. recurva*. It is a dwarf-growing plant, with no distinct leafy stem as in most other Fritillaries. It produces a tuft of grassy leaves, and sends up numerous one-flowered flower-stalks a few inches high. The flowers are bell-shaped, about one and a half inches long, bright golden-yellow, and nod gracefully on slender stalks. The little *F. armœna* of Asia Minor is a similar species; one variety has yellow flowers as in *F. pudica*, the other is a dark purple.

F. Pyrenaica (Pyrenean Fritillary).—Among the Fritillaries having flowers of a vinous-purple hue—a colour singularly prevalent in the genus—the Pyrenean species is one of the handsomest, and being a strong grower capable of holding its own, even in the wild garden, it is most desirable. The flowers are not showy, but being of a beautiful bell-like form, and produced several together on tall slender stems, they have a remarkably pretty appearance in masses. The odour of the flowers, however, is not pleasant. Of similar aspect and of equal robustness, the following species may be conveniently classed under the same head:—*F. nigra*, *lutescens*, *Lusitanica*, *Hispanica*, *Messanensis*, *involucrata*, *racemosa*, *acmopetala*, *Pontica*, *lanceolata*, *cirrhosa*, *parviflora*, and *atropurpurea*. These all have vinous-purple flowers of various shades, more or less chequered, and bell-shaped, produced on slender stems, varying from a few inches to one and a half feet high. They all possess a quiet beauty which true lovers of flowers appreciate quite as much as that produced by brilliant colours. Being all hardy and for the most part of strong constitution, they are able to take care of themselves, and no place suits them better than a hardy plant border which is left undisturbed from year to year. They flower plentifully about the beginning of summer, and continue in bloom for some weeks.

F. recurva, one of the Californian Fritillaries, is perhaps the most beautiful of all as regards the colour of the flowers. It is so different from the European species in the bulbs, that botanists have separated it as a sub-genus under the name of *Liliorhiza*. It is of slender growth, the stems varying in height from a few inches to as much as two feet, and even three feet in height, the latter height having been attained in an English garden. The number of flowers varies from one to as many as twenty on the strongest stems. The flowers, produced about the beginning of May, are bell-shaped, from one to two inches in length, and droop gracefully on slender stalks. The colour is a bright orange-scarlet, with mottlings of yellow. It is not an easy plant to manage, for while it is not quite hardy, it dislikes confinement in a house; therefore, the best way to treat it is to plant the bulbs out in a bed of light and well-drained soil, under a frame or hand-light in full exposure. The lights of the frame should only be placed over the bulbs in very cold or very wet weather, and every advantage should be taken to give the plants the full benefit of sun, particularly when growth is perfected, and the bulbs require to be thoroughly ripened. Some of the most successful cultivators of this bulb assert that if the bulbs are lifted annually and kept out of the soil a few weeks and then planted, they are more likely to keep in a healthy condition. It is a native of the Sierra Nevada.

F. tulipifolia.—With this species may be classed several of a like description, characterised by slender flowers, for the most part of a deep purple. Among these are *Ehrharti*, *tenella*, *dasyphylla*, *obliqua*, *liliacea*, and *Ruthenica*. *F. tulipifolia* grows about a foot high, and has slender stems generally bearing a single bell-shaped flower of a deep reddish-purple. The others named above are somewhat similar, and all are quite hardy, and thrive in any ordinary border.

THE PEACH AND NECTARINE UNDER GLASS.

By William Coleman.

GENERAL MANAGEMENT.

Ventilation.—The Peach, like all other stone-fruit trees, when placed under glass requires a liberal supply of ventilation, particularly through the early stages, including the setting of the fruit, and again when it is colouring and ripening. Without air the flowers open pale and weak, pollen is deficient and infertile, and as a consequence the fruit does not set. The wood-buds, too, are drawn out in advance of the flower-buds, when the growths become long-jointed, weak, and sparely furnished with triple buds capable of furnishing fruit and wood in the succeeding year. The fruit, deprived of a supply of oxygen, is pale, watery, and inferior in flavour, if it does not ripen prematurely when it ought to be taking the last swelling.

To counteract, or rather to prevent this evil, the ventilators should be conveniently placed for admitting air in all weathers without producing sudden depressions or creating a draught, when the young foliage is soft and tender. As soon as the house is started, open the ventilators more or less according to the state of the weather, whenever fire-heat is applied, and close them for a time in the afternoon when it is shut off, always bearing in mind that gentle heat with ventilation is better than a close house without it. Managed in this way the flowers will come on steadily, and open with anthers and pistils strong and fit for their office. Maintain a constant circulation by day and night when the trees are in flower, unless the weather is inclement, and too much fire-heat would be needed to keep the temperature near the mark. When the fruit is set, admit a little air early on fine mornings, gradually increasing it until the maximum, although low, is reached, then as gradually reduce, and finally close when the house is damped or syringed in the afternoon. As the sun gains power, more air will be needed to prevent the house from getting too hot, but never to lower the temperature if it can be avoided, as sudden checks from this cause are very injurious. After the stoning is complete, air freely through the early part of the day, and shut up close with sun-heat and moisture for two or three hours in the afternoon. This closing with solar heat will help the fruit forward without producing weak, long-pointed wood, while time so gained will allow the trees to rest in a low temperature through the night.

Before the Peaches begin to colour, raise all that can be placed on the top of the trellis apex upwards, and support them with short pieces of lath resting on the wires, and from this time admit a regular supply of air to increase the colour and flavour. The more air that can be admitted without lowering the temperature, the better will be the colour; and a perfectly-coloured Peach is, as a rule, perfect in flavour. As soon as all the fruit is gathered, more liberal ventilation will benefit the trees, until the time arrives for throwing all the lights open or stripping the house. Mid-season houses require equally as much care as early ones through the early stages; but when fine summer weather sets in, air may be admitted on a very liberal scale. In fine, settled weather, the flavour of the fruit is greatly improved by full exposure to the sun; but on no account must a ripening Peach be reached by spots of rain, otherwise the tender cuticle will be bruised and disfigured. Late houses are generally thrown open to retard the fruit through its early stages, as it can then be kept back to the benefit of the trees, while shading to retard it after it is ripe robs it of its flavour and injures the trees.

Syringing.—When Peach-houses are closed for forcing, atmospheric moisture becomes necessary. This may be supplied in two ways: first, by the direct syringing of the trees; and secondly, by damping the paths, floors, and walls of the house, and the introduction of fermenting material after it has been properly worked and purified from injurious gases. The evils of both too much water and too little have been described under THE ORCHARD HOUSE, p. 131, Vol. III. To steer clear of these evils, the early house should be well syringed with tepid water before noon, up to the flowering period, and damped down once or twice when fire-heat is continued throughout the day. Add to this the warm vapour and ammonia set at liberty by frequently turning the fermenting material, and the atmosphere will be more genial to the early trees than constant cold saturation.

When early trees are in flower, a dry warm atmosphere is recommended; but this is liable to be carried to an excess in cold frosty weather, when constant fire-heat is necessary. Although direct syringing might be as fatal to perfect fructification as cold cutting draughts, this does not dispose of the fact that an over-dry atmosphere distresses the tender and delicate organs of the flowers before they have properly performed their office. Therefore, through this stage also, moderate moisture from damping on all fine days, and the assistance of fermenting leaves with ventilation, will favour a good set of fruit.

As soon as the critical part of the work has been got over and the young fruits begin to swell, regular syringing on all fine dry mornings, and again when the house is shut up in the afternoon with solar heat, will be necessary. But the syringing should always be performed in time for the foliage to get dry during the hours of daylight. From this time till the fruit begins to change for ripening, vigorous syringing, with pure soft water if it can be obtained, must not be neglected, or the foliage will become infested with spider. If pure soft water cannot be had, then other water, free from calcareous matter in suspension, must be used, as the sediment from hard water containing lime marks the woolly coats of the Peaches, and renders them unsightly when ready for use. When the trees through bad management are attacked by red spider, the syringing must be most vigorous to dislodge it. Then, and then only, for a few nights in succession, the parts affected may be kept constantly wet to destroy the web and render this drought-loving enemy's position untenable. During the time the fruit is ripening, syringing must be discontinued; but after it is gathered, the garden engine or hose will be found useful in cleansing the trees of all accumulations

and insects. Houses started after Christmas will require similar treatment through the different stages; the quantity of water used must, however, be augmented with increasing length of days, as solar heat and light will protect the early buds from injury, and evaporation will be more rapid. It generally happens that the late and latest houses are found to be on the verge of bursting into vigorous flower before syringing is thought of, a fair proof that incessant syringing is not absolutely necessary. An occasional washing with tepid water before they expand will refresh and help them on, provided it is always applied early in the day, and fire-heat is at command in the event of frost.

Watering.—No rule can be laid down for watering the trees, as so much depends upon the depth, width, and elevation of the borders. When the surface of a border is on a level with the floor, it does not take so much water as one that is elevated above it. Then again the nature of the materials used, and the depth of drainage, make a great difference, as sandy loams take water more frequently than marly or clayey loams. The roots should never be allowed to become dry, otherwise spider will attack the foliage in summer, the fruit will ripen prematurely, and dormant buds will drop in showers when they ought to be swelling into leaf and blossom.

It is usual to advise the first watering to be given when the house is closed; but in order to make success a certainty, preliminaries for the next year's crop should commence as soon as the last is gathered. Many crops of Peaches are doomed long before the closing of the house takes place, when the generally-advised first watering would be too late. Consequently, in order to keep the roots progressing, as Peach-roots will progress, be very careful to keep the soil in a thoroughly moist, growing state throughout the winter, and there will be but little fear of the trees not swelling their buds. If we examine a Peach-tree that has been lifted in the autumn and re-planted or potted in fresh, fairly moist soil, we find that two or three weeks have sufficed for the formation of numerous new roots. These, if inside the house, should be kept progressing by means of continuous supplies of moisture from the tanks; if outside, the natural rainfall will keep them right, and they in their turn will steadily feed, fill, and plump up the buds ready to burst into perfect flower when a little warmth is applied to them, almost as soon as the house is closed. Assuming then that the trees have been wintered properly, and well watered before the house was closed, it is not unlikely that the occasional syringing and partial covering with fermenting material will keep them in a satisfactory state until the fruit is set. Then, if necessary, another watering can be given; but unless it is really needful, it is best to avoid heavy watering until the young fruits have pushed off the remains of the flowers. From this time until the fruit begins to show signs of ripening, three or four thorough waterings will be needed.

The quality of the water must be regulated by the age and condition of the trees; if young, vigorous, and not over-cropped, ordinary tank-water passed through a thin layer of old Mushroom dung just enough to prevent evaporation, will be sufficient, certainly at first, if not throughout the season. Old heavily-cropped trees that make a profusion of short pieces of blossom-wood require more generous treatment, and may receive liberal supplies of clear, diluted liquid at every watering, always in sufficient quantity to moisten every part of the borders, with the greatest advantage. For general purposes there is nothing better than the clear liquid which drains from hot-beds or the cattle-shed, provided it is well diluted. Weak solutions of guano or soot, when the foliage is deficient in substance or colour, also make excellent stimulants for occasional use. These stimulating liquids are easily prepared by filling bags with soot or guano, and sinking them in soft-water tanks in the houses or in barrels outside, where clear water can always be had ready for use. When watering the borders in fruit-houses, the great danger attending the application of strong stimulants must be guarded against, and the water should always be a few degrees warmer than the mean of the house. The watering of late and early houses differs in no way, except that the quantity which large trees with every leaf exposed to the sun and not more than eighteen inches from the glass will take, will be considerably in excess of the supplies required by early trees, while heavy mulchings will greatly economise labour in its application. The latest houses, including Peach-cases, should be furnished with hydrants, to which short lengths of hose-piping can be attached for watering and cleansing purposes. Where a pressure of water is at command, the fixing of a set of pipes is inexpensive, and the saving in labour, independently of the superior quality of the fruit from well-fed trees, quickly covers the first outlay.

Fertilisation of the Flowers.—Little need be added to what has been said upon this head under The Orchard House, Vol. III., p. 131. All other conditions being right, it is questionable if free pollen-producing varieties would not set plenty of fruit without artificial aid, but shy kinds like Noblesse barely set enough even when foreign pollen is carefully applied. Where Royal George, Violette Hative, or Bellegarde are grown, they should be passed over

first, as they produce an abundance of fertile pollen, and when the brush is well charged, the shy or delicate kinds should be impregnated, returning from time to time to the free pollen-producers for a further supply of pollen. This operation may be repeated from day to day until the latest trees begin to drop their petals, when there will no longer be any need for its continuance.

As the season advances and the trees under the influence of increased solar heat break freely into a vigorous blossom, artificial impregnation may be of less consequence: but even then all shy-setting trees should be attended to. In large, lofty houses, where the use of the camel-hair pencil would be impracticable, a bunch of soft feathers, as used for dusting delicate china, placed on a light rod, answers the purpose very well. Late houses and wall-cases open to insects do not often fail to set a crop of fruit; but it is very doubtful if systematic cross-fertilisation does not increase the size and weight of all kinds of stone fruit.

Disbudding.—When it is borne in mind that a healthy Peach-tree forms as many buds as it does leaves on shoots of the current year, and that the majority of these will develop into blossoms or shoots in the succeeding year, it will not be difficult to arrive at the conclusion that a great number of superfluous buds will have to be removed to prevent it from becoming a tangled and disorganised mass. It has already been explained that the fan system of training is the best, and that the framework of the young tree is formed by timely and judicious disbudding. After the tree is properly formed it is still necessary to keep it regularly and evenly furnished with annual growths for succession, and as crowding would prevent their proper development and maturation, the cultivator is still obliged to disbud. The time to do this must be governed by the condition of the tree, or any particular part of the tree. If from any cause it appears weak and the growths do not push away freely, disbudding should be delayed until the sap becomes more active, as the removal of a number of buds or young shoots, while it is in a weak state, stagnates the fluids, and still further checks, if it does not seriously injure, the tree. Vigorous trees, on the other hand, are always fit for disbudding by the time the young fruit begins to push off the remains of the blossoms. Sometimes a few foreright shoots may be removed from the leading branches at an earlier date, particularly if they are likely to become too strong or rob the weaker parts of the tree. If the bearing wood in extension-trained trees was properly thinned at the autumn pruning, it will be necessary to select a well-placed promising young growth near the base, others fifteen inches apart, and the terminal bud for future training. All the others may be taken off by degrees, the foreright and back shoots first, then after a short interval one-half of those left may be removed, and finally the remainder.

The operation of disbudding from the beginning to the finish generally occupies about three weeks; the first part is performed with the fingers, and the latter part, as the shoots gain strength, with a sharp knife. If any of the young shoots which it is necessary to remove have fruit set at the base, they should be cut or pinched back to three or four leaves at first, and finally removed with a sharp knife after the fruit is thinned. When the trees get into free growth, all the shoots which have been carefully retained, particularly those near the base of the bearing wood, should be neatly heeled in with soft matting. The first tie should be made very near the base or junction with the parent shoot, and it should be drawn as tight as safety will admit to secure a straight branch when the fruit-bearing shoot is cut away. When all the base shoots have been heeled in, an experienced person should go over the trees to remove any of the intermediate growths that are likely to interfere with the full development and extension of those originating at the base, and to pinch any that are likely to become too vigorous. Particular attention should be devoted to this final thinning, as it is a prevalent error to tie in more shoots than are wanted to furnish the tree. All goes well until by degrees the foliage becomes crowded, and never gets dry after the afternoon syringing; the wood is weak, elongated, and shut out from the consolidating influence of the sun and light, and the fruit is pale, flavourless, and watery. Unfortunately, the result of this mismanagement does not end here. This overcrowded set of shoots is furnished with imperfectly-formed buds, which drop either before or after they open, while vigorous trees, relieved of the load they ought to carry, become gross and require lifting, generally called root-pruning.

When strong young trees furnished with more wood-buds than fruit-buds start into growth, disbudding may be commenced as soon as they begin to move, always beginning at the top and working gradually down to the base where the flush of sap is less powerful, and the growth naturally later. In course of time well-managed old trees become very floriferous, the blossom-buds being out of all proportion to the wood-buds. These trees as a rule set an enormous number of fruit, which afterwards have to be rubbed off at what may be termed preliminary thinnings; and though the work is carried on with the early disbudding, it is much better to remove them before they open, as the flowering process alone is in this case an unnecessary tax upon the trees. The best way to perform this is to go

over the trees a few days before the blossoms open, and draw the finger down the under sides of the thickly-furnished shoots, taking with it all the pendent flower-buds, which, owing to their position, no good Peach-grower would select for his crop if he could do without them. This thinning of blossoms is not nearly so much attended to as it ought to be in old Peach-houses; and yet we have only to take note of shy-flowering kinds like the Old Noblesse and Walburton Late Admirable, which almost invariably set every flower and bring the fruit to maturity.

Thinning.—When well-managed healthy trees have the run of good borders, they generally set a great deal more fruit than they are capable of ripening. The first thinning is generally made as soon as the Peaches begin to throw off the remains of the blossoms and the best-placed fruits take the lead. Where the triple buds have set in twos and threes, these are reduced to one fruit, naturally the best; then, all that are small and weak or badly placed either above or below the wood or near the wires are taken away, leaving a considerable number to select from at the future thinnings. When they attain the size of small nuts, a second thinning off of the least promising, both as to size and position, improves the appearance of the crop; but it is still too heavy for the trees to ripen up, and as there is the possibility of losing some at stoning-time a liberal surplus is generally left to allow for this loss. This precaution, however, if carried to excess, very often defeats itself, as the great strain of stoning double the number actually required to ripen frequently leads to the dropping of some that would otherwise stand. To render these remarks practical, it may be assumed that if a tree covering two hundred feet of trellis is to carry two hundred Peaches, a surplus of fifty will be quite sufficient to leave for dropping. As soon as the fruit has completed the formation of the stones, the final thinning should take place, leaving all the finest on the upper sides of the shoots, as they are in the best condition for colouring to the apex, and removing, as far as possible, those beneath the shoots or near the extreme points, where the wood is weakest, and the least likely to be thoroughly ripe.

Fig. 20.—Spur of Royal George Peach.
Thickly set and ready for Thinning.

Opinions differ as to the weight of crop a Peach-tree can carry to perfection without weakening it for the succeeding year. Some leave one to every square of ten inches; but it is a very heavy crop, and does not produce a greater weight than the same tree would yield were the squares extended to twelve inches, while the extra weight of stone, the smaller size of the fruits, and the deficiency in flavour would tell against the greater number in point of market value. The ordinary kinds of Nectarines, which do not average more than six or seven ounces, may be left closer than Peaches, which ought to average ten ounces; while some of the new varieties of Nectarine, like Stanwick Elruge, Albert Victor, and Lord Napier, grow into the greatest weight and value when thinned to ten inches to the square. These remarks apply to healthy, vigorous trees, from which good crops may reasonably be expected; weakly trees cannot be induced to crop so freely, and the fruit may be left upon them, but they will resent the oppression by thinning themselves at stoning-time.

Stoning and Elevating the Fruit.—When Peaches are stoning, the temperature should be kept

as steady as possible, and ventilation, syringing, and damping should all tend to the relief of the tree and provision for its wants before it has time to feel them. If this is carefully attended to, and plenty of time is allowed, not by starving them through the day, but by resting them, with a chink of air on, through the night, tender trees will stone well, and split stones will not be so plentiful as they otherwise would be. After the final thinning an effort should be made to get every Peach and Nectarine on the upper side of the trellis, where exposure to sun, light, and air will insure colour and flavour. By the constant removal of pendent fruits at every thinning, and the selection of the best on the upper sides of the shoots, a crop of properly-placed Peaches can often be obtained without much trouble; but when a fine fruit that cannot be spared happens to be below the trellis, every effort should be made to elevate it. This can best be accomplished by placing short pieces of lath across the wires, when by a little careful and dexterous management in turning and tying, the fruit can generally be raised above the foliage. When this cannot be done, the surrounding foliage should be turned aside or tied back to let in the sun and air, in preference to cutting away the leaves as is sometimes practised. All who admire and appreciate a dish of perfect Peaches, know that every fruit standing out with the stalk downwards is in its proper position; but if the colour has been laid on near the stalk to be hidden in the dish, and the apex of the fruit is pale, the manipulation of that Peach by the grower has not been so skilfully managed as it might have been. There are some fruits on strong leaders that cannot be turned apex upwards; but a little skill and patience devoted to this apparently trifling subject will pay the producer and exhibitor, while it pleases the observer and the consumer.

Ripening, Gathering and Preserving the Fruit.—When the fruit on the earliest trees begins to change for ripening, they must have a constant circulation of dry, warm air, and full exposure to the direct rays of the sun. In fine, warm, settled weather, the lights may be run off mid-season and late houses for a few hours every day; but on no account must a spot of rain fall on the fruit, neither must it be pressed by the fingers to ascertain if it is softening, as either of these will result in marks when the Peaches are ripe. If there is any danger of the surface roots of the late trees becoming too dry before the crop is taken, and so hastening maturity, a light covering of sweet hay placed over the borders, while keeping in the moisture, will form an elastic medium for catching any fruit that through accident or oversight may be allowed to fall from the trees. This, however, should not happen, as a Peach should never be left on the tree until it is dead-ripe, even for home consumption. For packing and sending to a distance, either for private use or market purposes, they should be gathered while they are yet hard to the touch near the stalk, but not before they begin to give off their delicious aroma.

The following paper was contributed by me to the *Gardener's Chronicle* some five years ago, and as it fully exhausts the important subject of gathering and packing, with the Editor's permission it is herewith reproduced.

Packing Peaches.—Under the false impression that Peaches do not attain their full market value until they are quite ripe, eight out of ten private growers of this valuable but perishable fruit allow them to hang too long on the trees before they commence gathering, and are considerable losers thereby. As soon as a Peach has attained its full size and colour, although quite hard to the touch, it is in the best possible condition for sending to the fruiterer. Risk of injury in packing and travelling is then comparatively small; the gain of a single week in the case of early Peaches often makes a considerable difference in the price, and it arrives in a fit state for storing away in the vaults, to come out in its turn, instead of having to be thrown into the market immediately upon delivery. By way of illustration, I may state that it is no unusual thing for Covent Garden fruiterers to have sixty to one hundred dozen of Peaches at one time in July in their vaults, gradually ripening, and these are the fruit for which they pay the highest price to the growers, for the simple reason that they can hasten or retard them to suit their trade. Every private gardener, who is in the habit of sending to his employer's town residence, knows that it is not safe to be without ripe Peaches for immediate use, and this fact soon teaches him that these over-ripe fruit when sent to the market at the eleventh hour are sold at a great loss to the grower and annoyance to the dealer, who is obliged to force them on a glutted market, instead of storing for a few days to meet a good order, which might enable him to give a higher price. Having shown that the state of ripeness is quite as important as the mode of packing, the following remarks may be of use to the young beginner.

Always have a good supply of dry moss in store—the best and cheapest of all packing materials. If properly beaten and prepared it is soft, elastic, and never heats in the boxes. Be careful in the use of bran, an excellent thing if pressed very tight; but having a tendency to sink in bulk when shaken on the journey, the Peaches become loose, separate from

the packing, and arrive in a bruised and worthless condition. Never use wadding, the worst of all packing materials for soft perishable fruit, as it absorbs moisture, becomes very hard, and heats on the journey. Avoid using large boxes; 24 inches by 14, and 4½ deep, is a suitable size for twenty to twenty-four fine fruit. Always have the lids in one piece, and cord two or more boxes together. Place the direction label and one marked, "Fruit with care, this side up," on the top, to be met at the terminus. Always gather in close at the end of the week, and never send away later than Friday morning. Although Peaches may be sufficiently advanced for sending away, their hold is too firm to admit of their being plucked from the tree without injury by the pressure of the fingers; but if a piece of wadding be taken in the left hand, with which the Peach is firmly grasped, and a pair of finely pointed scissors used with the right, it may be detached without being bruised. It should then be placed on a piece of tissue paper nine inches square, and laid in a shallow basket containing a good bed of moss. When gathering, which should always be performed in the morning, is finished, prepare the boxes by lining the sides and ends with paper, allowing the half of each sheet to hang over the sides for turning over the top when all is finished. Then place a good layer of moss evenly over the bottom, slightly elevate one end, and commence by folding the fruit in the sheets of paper on which they are resting. Shake a little moss along the lower end of the box, and place the first Peach in the left-hand corner: keep in its place with the left hand, follow with more moss and fruit, never removing the hand until the first row of four fruits is finished; form a division with more packing, and proceed until the box is full. Each Peach will then be resting in a soft bed of moss, an inch from the bottom, and the same distance apart. Continue the introduction of packing until every fruit is quite firm in its place; spread a layer of moss over the top, turn up the half-sheets of paper and put on the lid. A little judgment is needed in putting on the last layer of moss, as safety in transit depends upon the tightness secured in putting on the lid. If moss cannot be obtained and bran is used, the boxes should be well lined with plenty of paper to turn over the top, to prevent it from working out. Make a good bed, as fruit is often spoiled by being placed too near the bottom; place all the Peaches on this bed, keeping them half an inch from the sides and an inch apart; fill up with bran and shake it down; but do not trust to shaking only, as shaking on the railway soon reduces the bulk, and in nine cases out of ten where bran is used, the Peaches work up to the top or one end, and the bran going in another direction, they arrive in a bruised condition. An abundance of bran should be worked into the corners and between the fruit, and well pressed down with the fingers until every part is firm, and a little higher than the sides of the box, then turn over the paper and nail down the lid. When packing for market, always make "firsts" and "seconds," and place record of quantity on the lid.

When large ripe Peaches have to be packed for immediate use, they should be gathered a day or two before they are wanted, and placed upon squares of paper on hair sieves. Great care must be observed in moving them with pads of wadding in the hands, and an extra quantity of moss should be placed under them in the boxes. The folding of these and all tender fruit is best performed on a sheet of wadding spread upon the table, and they should be packed with the points upwards. Nectarines can be packed in shallower boxes; in other respects they should be the same size, as a number of boxes can then be corded together.

Keeping Peaches.—When a number of fine Peaches are wanted for any special purpose on a particular day, and their keeping in a good condition on the trees is doubtful, they should be carefully gathered before they are quite ripe, as the slightest pressure or injury in detaching them from the wood results in a bruise, fermentation follows, and the object in view is defeated. When Peaches are very fine they sometimes swell nearly round the wood to which they are attached, and their removal without injury is very difficult. If attached to a piece of wood not a leader that is to be cut out at the next pruning, with a pair of pruning scissors cut above and below the fruit, and leave the short piece of wood attached to the fruit for a few days, when it will part readily without leaving a bruise. After the Peaches are detached, place them on hair sieves with a square of paper under each fruit for convenience of moving without handling them, and convey the sieves to a cool, airy place, where they will be safe from vermin. Some kinds of Peaches keep better than others. All the Grosse Mignonne section and the Noblesse are very tender, and not so well adapted for keeping as Bellegarde and Barrington, which can be kept for ten days—sometimes a fortnight, if gathered in time, but the secret of success lies in gathering early. That fine late Peach, Sea Eagle, is one of the best Peaches for keeping a long time after it is ripe. These remarks do not apply to such coarse clingstones as the Salway, which are only fit for compôtes.

Dishing Peaches.—Every grower of Peaches should dish his own fruit. It is distressing to see how often large luscious Peaches are piled up in dishes by people who do not learn by experience that

pressure of the fingers leaves marks, which not only spoil their appearance, but also destroy the delicious flavour of any fruit that may be left over until the following day. When a large dish of Peaches is piled up for a dinner-table, some light, elastic material like artificial moss should be used for a foundation; upon this place a few fresh Vine-leaves, and arrange the first layer with leaves between them to prevent pressure. Then, with the points of a few more leaves protruding, arrange the second tier, and so on until the pile is formed, reserving a perfect fruit for the finish. The number of fruit in each layer must of course be regulated by the stock in hand, and the number of guests. When more than a dozen Peaches are required, duplicate dishes should be made; indeed the most tasty dishes can be made with a smaller number of fruit, say five, seven, or nine, placed on an elevated foundation covered with leaves. Each Peach then stands out singly, little if any the worse, if not used, for having been admired and afterwards removed from the dining-room. Many housekeepers make a point of removing all their surplus from the dishes as soon as they are taken down. This is a mistake, as it entails unnecessary manipulation. It is better to leave perishable fruit on the soft, cool leaves, in an airy room until it is again wanted for use, and then to dish up again with the necessary additions.

When fine, well-coloured Peaches are dished for exhibition, there should be no piling or turning round, as defects will out. Neither should they touch each other. If a number of dishes of one or more varieties are about to be made, prepare all the dishes by forming on each an elevated base of bran. Cover well with green but not remarkaby young Vine or other favourite leaves; then, as the Peaches are unpacked, place them at once on the dishes, according to their size and kind. Never attempt to strengthen a dish by using an over-ripe or faulty fruit because it has been extra fine; but let each exhibit consist of evenly-sized fruit that are sound, symmetrical, and ripe enough for the table.

Insects.—The insects to which the Peach is subject are not numerous, the most troublesome being red spider; but the first that puts in an appearance is the ordinary green fly, hence the importance of keeping the house clear of soft-wooded plants, like Cinerarias or Geraniums, from the time the trees are dressed in winter until after the fruit is set; and even then it is a very good rule to fumigate every house once or twice before the blossoms open. If this precaution is neglected, and fly is lurking about ready to establish a colony on the first wood-buds, there is great danger of its spoiling or sadly crippling the trees before the fruit is set, as they cannot be fumigated during the time they are in flower. At all other times tobacco-smoke is a sure and speedy remedy, provided it is not too strong. A calm, dull evening is the best time to fumigate, and two mild smokings are preferable to one dense volume. The tobacco-paper should not be allowed to burst into flames, and the house should be well syringed before the sun strikes the roof the following morning. Where smoking is impracticable or objectionable, a decoction of Quassia chips syringed over the trees will keep the fly in check.

Red Spider.—This troublesome little pest sometimes attacks the trees during the time they are in flower. It generally starts in some dry out-of-the-way corner, near the hot-water pipes, and quickly spreads if neglected. Dryness at the roots, imperfect winter cleansing of the trees, or structure, or the introduction of that great bane to Peach-houses, the pot Strawberry, may one or all contribute to its first outbreak. Prevention being better than cure, the trees may be well syringed with a weak solution of soap and sulphur once or twice before the flowers open, and again in suspicious parts after the fruit is set. If it appears during the time the fruit is swelling, its presence is due to bad management, for which no excuse can be found, as Peach-trees should never be allowed to become dry at the root, and, unlike a house of Grapes, there is nothing to be injured by regular and copious syringing. It is, however, while the fruit is ripening that spider is most troublesome; strenuous efforts should therefore be made to have the foliage clean at the time syringing is discontinued, and the roots in a proper state as to moisture.

Brown Scale.—Trees that are subject to brown scale should be carefully washed twice over with warm soap-water, a soft brush being used for the young shoots, and a hard one for the older branches. When dry, paint with a solution of Gishurst compound, eight ounces to the gallon of water, thickened to the consistency of cream by the addition of stiff loam and cow-dung. Watch the trees when they break into growth, and if it again appears, go over the parts affected with a dry, half-worn painter's brush. When once disturbed, scale cannot re-establish itself. Some syringe the trees after the leaves fall, with water at a temperature of 120°; but the best preventive of scale is sound, healthy growth in a good border, with plenty of air and good syringing.

Black Thrips.—When these insects gain a position in a Peach-house, their presence is invariably due to the introduction of plants of some kind, hence the importance of keeping out Azaleas and others subject to thrip. If allowed to spread, it soon be-

comes very troublesome and destructive, as it destroys the foliage by feeding along each side of the midrib. The best means for its destruction is fumigating with tobacco-paper. The first smoking generally kills the old insects, but it has no effect upon the larvæ, so it should be repeated three times within a fortnight to catch the young before they have time to breed. In this way a complete clearance can be speedily effected. Where tobacco-smoke cannot be used, repeated syringings with tobacco-water, two ounces of shag tobacco steeped in one gallon of boiling water, will soon clear the trees, provided the dressing can be applied without touching the fruit. If taken in time, sponging with the liquid is a certain remedy. Tobacco-water should be applied after the sun goes down, as the foliage does not then dry so quickly, and it should be washed off before the sun again strikes the roof of the house.

Diseases are confined to gumming and mildew. The first is generally caused by an accident to the bark, such as bruising or neglecting to remove tight ligatures, by pressure against the ironwork of the trellis, or by nails on open walls. When a branch is bruised it can often be saved by having all the injured parts of the bark and wood pared away with a sharp knife, and binding up with a strip of new turfy loam to keep out the air until it is healed. The same treatment applies to wounds produced by the removal of large branches, a most objectionable operation in the management of trees generally, stone-fruit trees especially, as they are always subject to paralysis from hidden injuries received in preceding years. When a branch is deeply cut with a tie, the leaves ripen early, and it eventually dies. If fan training is practised, a branch injured in this way can generally be removed at the winter pruning when the sap is down. An accident of this kind cannot readily be repaired in a Seymour-trained tree. When gumming is brought about by a gross habit of growth, induced by the use of rich manure, strong shoots should be pinched, as soon as they begin to take the lead, to divide and throw the sap into other and weaker channels all over the trees; and properly balanced shoots should be allowed to grow to the fullest extent, as an outlet until the autumn, when lifting and re-planting in poorer soil will generally correct the tendency to grossness and its attendant evils, gumming being one of the worst.

Mildew.—When mildew attacks Peach-trees on open walls or in houses, it can frequently be traced to one or other of two extremes. The borders may be cold, wet, and unfavourable to root-action, while the atmosphere may be favourable to development of the spores; or the borders may be hot and dry, when, as is often the case amongst Roses and Peas, mildew will spread as if by magic. The first case can be cured by lifting, draining, and placing the roots in a more genial soil; the second, by liberal supplies of water to roots, leaves, and stems, and the application of sulphur to the foliage when it is damp. It can be syringed off at the end of twenty-four hours, and repeated if necessary. Some sulphur the pipes when hot, others syringe with clear sulphur-water. Royal George, a variety subject to mildew when grown in a cold house, should be closely watched and dressed in time to prevent the fungus from attacking the fruit as well as leaves. When this is the case, sulphur may be applied to the fruit without doing injury, provided the latter is not in an advanced state, and there is time to syringe it off again before it begins to change. This the woolly coat of the Peach renders difficult but not impossible.

Blistered leaves are sometimes prevalent on open walls, but being unknown in Peach-houses, the cause and remedy will be treated of elsewhere.

MANURING IN THEORY AND PRACTICE.

By John J. Willis.

MANURES.

MANURES supply the soil with ingredients required by plants, which are deficient in the land either by reason of the exhaustion consequent on previous cropping, or from original poverty of composition. "To grow plants to perfection," says Cannell, "the art of '*Feeding*' and giving a regular and just sufficient moisture is the main secret, and if either is done too much or too little, the object suffers by showing some slight signs of weakness, and only by close observers are those signs of yellowness detected, until insects commence eating the under surface of the foliage and tender skins, and as soon as the sun shines the leaves become blotched from the fact of the under skin and vein being severed, and scorched brown by the sap not being able to flow; hence thousands of sickly-looking plants that abound in almost every garden." "Want of '*Food*' is the cause of market plants suddenly fading, although so beautiful when purchased."

The most complete return to the land growing crops would be accomplished, by manuring it with the excrements of the men and animals consuming the produce. This is partially done by the application of farmyard manure; but the congregation of men in cities, and the difficulty of using sewage with profit, prevents this plan from being thoroughly carried out.

Any manure which restores all the substances taken from the soil by the growth of plants is a "*general manure*," of which good farmyard dung is the most "*perfect type*," because it supplies not merely the mineral constituents, but also the carbonaceous and nitrogenous matters necessary for building up the organic structure of the plant. Artificial manures, on the other hand, are frequently supposed to be mere stimulants; and the very fact that but a small quantity of them may produce—as we have already seen—as much or more increase of crop than a very large application of farmyard dung, is sometimes brought as an argument against the use of artificial manures.

Farmyard Manure is a mixture of the solid and liquid excrements of animals, together with the straw or other materials used as litter.

The composition will naturally depend upon the character of the animals contributing to it, the quality of their food, and the nature and proportion of the litter.

The following table by Boussingault gives an analysis of the quantity of carbon, hydrogen, nitrogen, oxygen, and ash in the excrements of the horse and cow in their natural state, and after drying at a temperature of 212° Fahr.

	Horse.				Cow.			
	Natural.		Dry.		Natural.		Dry.	
	Urine	Dung	Urine	Dung	Urine	Dung	Urine	Dung
Carbon	4·46	9·56	36·0	38·7	3·18	4·02	27·2	42·8
Hydrogen	0·47	1·26	3·8	5·1	0·30	0·49	2·6	5·2
Nitrogen	1·55	0·54	12·5	2·2	0·44	0·22	3·8	2·3
Oxygen	1·40	9·31	11·3	37·7	3·09	3·54	26·4	37·7
Ash.	4·51	4·02	36·4	16·3	4·68	1·13	40·0	12·0
Water.	87·61	75·31	0·0	0·0	88·31	90·60	0·0	0·0
Total	100·00	100·00	100·0	100·0	100·00	100·00	100·0	100·0

From these results we see that, weight for weight, the urine of the horse, in its natural state, contains three times as much nitrogen as its dung; that of the cow twice as much; and the difference, especially in the horse, is still more conspicuous when they are dry. Potash forms about nine-tenths of the ash or inorganic part of the urine of the ox, while less than 3 per cent. of that substance is found in the solid excrement. Phosphoric acid is not met with in the urine, but forms about 10 per cent. in the composition of the dung.

We learn, therefore, that the urine of animals is far more valuable as a manure than their solid excrements, yet greater care is taken to preserve the latter, the former being too frequently allowed to run into the drains. The putrefaction of urine greatly promotes the rotting or "*ripening*" of long dung. When clean straw dung is dug into the soil it decomposes only very slowly; and hence when employed as manure its constituents are not soon available to plants. But when left in contact with putrid urine, the straw rapidly rots, and its ingredients pass from a comparatively inactive condition into immediately available plant-food.

Cow-dung is the most abundant and least valuable in composition of the animal manures. It decomposes slowly, giving out but little heat; hence it is said to be a "*cold manure*."

Horse-dung is more valuable than cow-dung. It contains, as we see from the foregoing table, less water, is not so coherent, and does not form during its decomposition an unctuous mass such as cow-dung does. Horse dung decomposes rapidly, and is, therefore, a "*hot or forcing manure*." It may be usefully added to cow-dung, rendering the latter more friable, whereby it can be more equally distributed throughout the soil.

Sheep-dung decomposes more rapidly than cow-dung, and not so quickly as horse-dung. It is richer in solid matters than the former.

Pig-dung.—The pig being almost an omnivorous animal, its excrements probably vary in composition according to the nature of its food more than in any other animal. Its dung is soft and compact, and decomposes slowly. It is one of the richest kinds of animal manures; but it is alleged that when used alone as manure it gives a disagreeable flavour to some vegetables, and on stiff soil favours insects.

Guano is the excrement of sea-fowl, and is found on rocky islets, principally on the coast of Peru, where rain seldom falls. It owes its value as a manure to the fact that it contains from 6 to 13 per cent. of ammonia from 10 to 14 per cent. of phosphoric acid, and 7 to 13 per cent. of alkaline salts.

Peruvian guano is considered the most valuable auxiliary manure which the gardener possesses, as it resembles, in the complexity of its composition, farmyard dung more than most artificial manures. It may be applied at the rate of from 3 to 5 cwts. per acre, but should never be sown without having been first sifted and any hard lumps reduced to powder. It is also a good plan before sowing to mix the sifted guano with dry soil or ashes. Care should be taken that it be not brought into direct contact with newly-sown seed.

Bones are largely used by gardeners as manure, and as they contain so large an amount of organic matter and phosphate of lime, it is not difficult to understand their value. The organic portion of bones (cartilage, gelatine) contains nitrogen, and, decomposing in the soil, forms ammonia, and assists in the fertilising action of the phosphate of lime. One of the best forms of nitrogen for manures is that furnished by the organic matter of bones, after having undergone a partial decomposition by acid; and it is to this fact, added to the superiority of the phosphates associated with it, that the preference given by gardeners to bone manures is to be attributed. These manures may be applied at the rate of about 5 cwts. per acre, and they are particularly useful in the growth of Chrysanthemums, Vines, and plants in pots, owing to the continuous and gradual form in which their constituents are taken up by the roots of plants.

Ground Phosphates are particularly suited to garden soils rich in humus matter when a slow and constant supply of phosphates and nitrogen is considered desirable, and when the soil is of too open a character to allow of the economical use of the more readily soluble manures. They may be employed for Roses and foliage plants in the form of fine powder.

Superphosphate forms the basis of many excellent fertilisers sold under the name of "Special Manures," and their value depends entirely upon the amount of available phosphates and of nitrogen present in their composition.

Two parts of superphosphate by weight to one of potash, applied at the rate of from 3 to 5 cwts. per acre, is a capital manure for Potatoes, Carrots, Beet, and other root crops; but its value is greatly increased by the addition of a small quantity of sulphate of ammonia or nitrate of sodium.

Either alone or with potash it is recommended for Beans, Peas, and other leguminous plants, whether in pots or in the open garden; Vines, Peaches, Apricots, and Nectarines are greatly benefited by a dose of this mixture, either dug into the soil around the roots, or dissolved in water at the rate of a quarter-ounce to a gallon of water, and applied in a liquid form. It will be found to be of the more benefit when there is abundance of decomposing organic matter present in the soil.

Experience has shown that an excellent mixture for Asparagus beds consists of 2 cwts. of superphosphate, 1 cwt. of nitrate of sodium, and 1 cwt. of common salt per acre, applied as a top-dressing in very early spring, when the beds are made up for the season. Superphosphate is a valuable manure for all green crops, and very useful in the early growth of white Turnips, especially in hastening the young plants beyond the stage when they are attacked by the "fly."

Sulphate of Ammonia is obtained by the evaporation of "gas liquor," produced in gas works, to which sulphuric acid has been added. It contains about 22 per cent. of ammonia, and is an exceedingly valuable nitrogenous manure. It is seldom used alone, but mixed with bone-dust, rape-dust, wood-ashes, peat-ashes, or superphosphate.

It may be applied at the rate of from 1 to 2 cwts. per acre, and must be well incorporated with the soil, or used in a weak liquid state. It will be found greatly to benefit Strawberries, Chrysanthemums, and many other plants; but it must be borne in mind that, though ammoniacal manures produce a marked effect on vegetation, it is necessary that all other requirements of plant-food should exist in the soil in an assimilable condition.

Nitrate of Sodium is imported in large quantities from South America, and is a valuable source of nitrogen to most species of plants. Being easily soluble and liable to be washed out of the soil by rains, this manure should be sown as a top-dressing, at the rate of about 1 cwt. per acre, at that period of the season when the process of plant-growth is the most active. A mixture of nitrate with phosphates, or in most cases potash and gypsum, is far better than using it alone.

Potash Salts.—All plants and crops abstract a large amount of potash from the soil, which, however, is in great part returned to the land again in the supply of farmyard dung. The most marked effect of an artificial application of potash is likely to be more apparent on poor sandy soils, naturally deficient in potash, than on good workable clays. The potash manure which merits special attention is "*Kainite*." The efficacy of this material is specially apparent in the case of Potatoes, Onions, Beet, and root crops growing on light soils, or on such as are rich in vegetable matter.

It may be applied with advantage to "*stone-fruit*" trees, including Vines, and to Roses.

As a practical proof of the great benefit to be derived from the application of potash and magnesia to the soil, may be mentioned the fact that in the Channel Islands, from whence some 30,000 tons of Potatoes, and large quantities of Cauliflowers and other vegetables, are annually supplied to the London market, hardly any manure is applied except seaweed, which, as is well known, contains potash, magnesia, common salt, and sulphuric acid, which are also the ingredients of kainite.

It must be remembered that the general tendency of nitrogenous manures is to favour the extension of foliage and give depth of colour, whereas that of the mineral manures, which include potash, tends to stem formation and production of seed.

Soot, Dried Blood, and **Woollen Refuse** are all largely used as manures.

(*a*) Soot consists principally of fine particles of carbon or charcoal; but it also contains from 16 to 30 per cent. of mineral matters, with from two to four per cent. of ammonium salts, to which its fertilising properties are chiefly due. It may be applied at the rate of from forty to sixty bushels per acre for Beans, Peas, Onions, and various other crops. It is more suitable for heavy than for light soils, and acts as a check to the ravages of insects.

(*b*) Woollen Rags are largely used in Kent as a manure for hops. The rags are mixed with five or six times their weight of earth, and the compost kept saturated with strong liquid manure.

Cotton rags are almost valueless for manurial purposes.

(*c*) Dried Blood is an excellent manure for most plants; when of best quality, it contains about fifteen per cent. of ammonia.

(*d*) Fish are frequently employed for manure. The best way of using them for the garden is in the form of a compost made with three or four times their weight of earth, with alternate layers of lime. The heap should be finally covered with earth, to prevent the loss of ammonia during fermentation. By this method the fish are rapidly decomposed, and make a rich compost, which may be used at the rate of 30 cwts. per acre.

Rape-dust. — When rape-seed is exhausted of its oil it comes from the press in the form of hard cakes, which, when crushed to powder, form the rape-dust so extensively employed as manure. It makes a good dressing for Onions, Potatoes, root crops, and plants in pots.

It may be sown with Turnip-seed, or seeds of the Cabbage tribe generally, and will be found specially useful during early growth in hastening the brairding of the young plants, and getting them beyond the reach of the "fly."

Rape-cake is most effective on moderately light soil, and in moist seasons, or where the plants are well supplied with water.

Lime, Chalk, and **Marl** frequently form manures of the greatest importance in the garden. And the most successful cultivation of Roses will be found where a liberal supply of marl can be obtained.

On soils naturally destitute of lime, as in the case of many clays and sandstones, these manures provide an indispensable element of plant-food. Pliny attests the use of slacked lime by the Roman cultivators as a dressing for the soil in which fruit-trees were grown. It is also applied with equal success by the Vine-growers in Spain. The purposes served by lime as a constituent of the soil are—

(1) It supplies a kind of inorganic food which appears to be necessary to the healthy growth of most plants.

(2) It neutralises acid substances, which are naturally formed in the soil, and decomposes or renders harmless other noxious compounds that are not unfrequently within reach of the roots of plants.

(3) It changes the inert organic matter in the soil so as gradually to render it useful to vegetation.

(4) It causes, or facilitates, other compounds, both organic and inorganic, to be produced in the soil, or so promotes the decomposition of existing constituents as to prepare them more speedily for entering into the circulation of growing plants.

(5) It proves very useful in tenacious, heavy clay soils, or soils rich in humus, while it may be dispensed with in light sandy soils.

In reclaiming peat-bogs, lime is of the highest importance.

Gas Lime is an excellent material in a compost for dissolving or disintegrating bones, leather cuttings, hair, woollen rags, or similar substances, which require energetic agents to reduce them to a pulverulent state, admitting of easy and profitable use as fertilisers.

To prepare gas lime for the garden it should be spread out on a layer of pond-mud, night-soil, leaf-mould, or any other coarse vegetable refuse, and exposed to rain and air until the odour is gone. The underlying mass of refuse will thus be advanced on its way to form an available manure, and the washings of the gas lime will be saved.

Liquid Manure is doubtless the soul of horticulture, and the gardener who buys artificial manures, but does not look carefully after the dark-coloured liquid which trickles out of his manure-heaps, or to the drainings from the house, stables, piggeries, &c., may be considered a wasteful gardener. Money and labour expended in the construction of a liquid-manure tank is well spent, and will yield a more than commensurate return. By means of glazed earthenware pipes all the sewage may be conveyed into this tank, which should be as far as possible removed from the well supplying the family with drinking-water.

Rain-water should not be allowed to run into the manure-tank, because the manure thus diluted loses

much of its fertilising properties. The manurial value of combined urine and solids in sewage has been estimated by Lawes and Gilbert at 6s. 8d. per individual per annum, but when by dilution it is increased to twenty-four gallons daily, its money value is reduced to about 2d. per ton.

That a given weight of urine is, generally speaking, of higher value as a fertiliser than the same quantity of solid excrements, has been mentioned when speaking of farmyard manure.

But it is to the urea and hippuric acid, crystallised bodies which exist in urine in the proportion of about one-third of that contained in the food of animals, that its immediate and most marked effect in promoting vegetation is chiefly to be ascribed.

These substances are nearly allied in their chemical nature and fertilising properties to the salts of ammonia.

Mr. Herbert J. Little, of Thorpelands, Northampton, in a report on Sewage-farming, in the

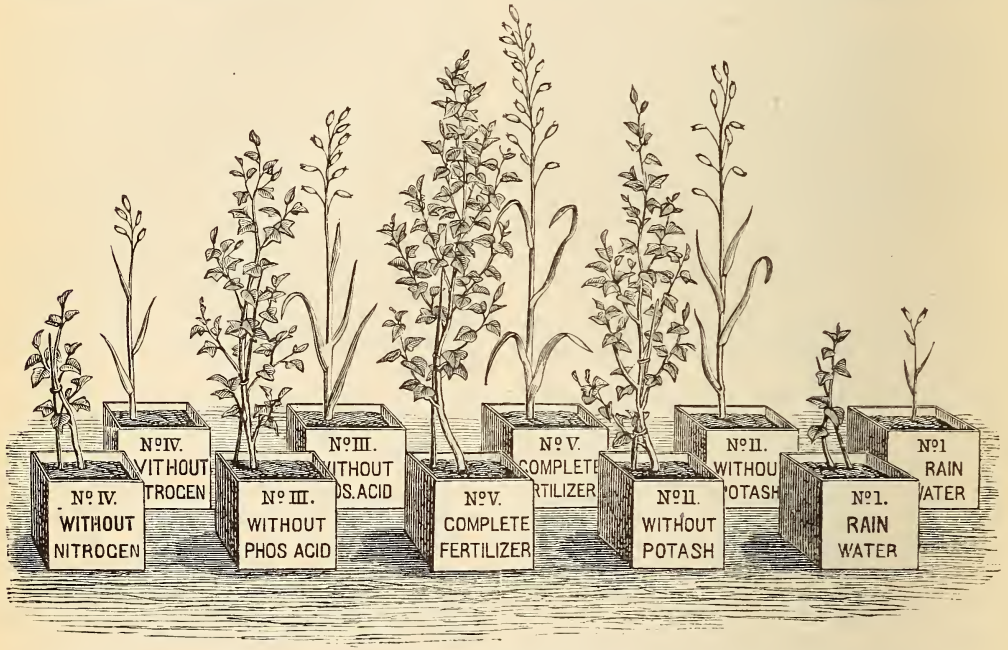


Fig. 11.—Experiment with Buckwheat and Oats Grown in Pure Sand, and Supplied with different Fertilising Ingredients.

The following table gives the analysis of the daily excretions of a male adult :—

	Fresh Excrements.	Dry Substance.	Mineral Matter.	Carbon.	Nitrogen.	Phosphates.
	oz.	oz.	oz.	oz.	oz.	oz.
Fæces	4·17	1·041	0·156	0·443	0·053	0·038
Urine	46·01	1·735	0·527	0·539	0·478	0·189
Total	50·18	2·776	0·683	0·982	0·531	0·257

These figures show that urine consists of certain organic compounds rich in nitrogen, mineral matter, and phosphates, dissolved in a large quantity of water—46 oz. of fresh urine yielding but 1·735 oz. of dry matter.

Journal of the Royal Agricultural Society for 1871, says . "When once the benefits of sewage are fully recognised, and the quick growth, early maturity, and superior quality of vegetables cultivated by its aid established, there should be no difficulty in the disposal of a portion of arable farms for this purpose, and, perhaps, no more satisfactory course could be followed.

"Onions, Lettuces of prodigious weight and splendid quality. Asparagus of great size, Celery of the finest growth, Water-cresses, Spinach, Cucumbers, Vegetable Marrows, French Beans, Broccoli, and Cauliflowers—these are but a few of the ordinary sewage-grown vegetables; whilst among fruits, Strawberries, Gooseberries and Currants all seem coming into favour. Strawberries at Barking have realised £75 per acre.

Fig. 12.—Experiments in Water-culture (*by Dr. Nobbe*) *at the Experimental Station in Tharandt, Saxony.*

The above engraving is copied from photographs of Buckwheat plants, grown with the roots immersed in jars containing various solutions of the ingredients of plant-food in water. The plants were supported by perforated corks resting on the covers of the jars, and by upright sticks. In jars I. and I.*a* was a *normal solution*, that is, a solution containing all the essential ingredients of plant-food, including potassium as chloride. The solution in II. was the same as the normal solution in I. and I.*a*, except that potassium was omitted in the jar II. The jar II.3 commenced as II., that is, without potassium, but potassium chloride was afterwards added. VI. contained the normal solution, except that sodium was substituted for potassium. IX., X., XI., and III., same as I., except that IX. contained no lime, X. no chlorine, and XI. no nitrogen, and III. had nitrate instead of chloride of potassium.

There seems no reason, moreover, why beauty and usefulness should not go hand in hand, and why the florist, as well as the gardener, should not seek for aid from sewage. Roses especially should repay cultivation remarkably well, considering their love of ammoniacal dressings, and abundant luxuriance and bloom would almost certainly reward the florist's efforts in this direction."

NECESSITY OF PERFECT PLANT-FOOD.

The fundamental principle upon which a manure is employed is that of adding to the soil an abundant supply of the elements necessary to the full development of the plants grown, and in such a condition as shall be best fitted for absorption by the plant-roots

When a horticulturist has obtained a general knowledge of the nature of manures and the wants of different plants, it will be of great service in guiding his practice if he determine, by actual experiment, what is the relative effect of different manures upon his various soils and plants; the influence of climate and season, with the previous manurial condition of the land, being always taken into account when interpreting the results.

When land is cropped and the produce removed, a gradual diminution of the fertility of the soil takes place, until at length, according to the natural resources of the soil, it becomes almost incapable of maintaining a crop. The exhaustion thus brought about is rarely if ever due to the simultaneous consumption of all the different constituents of plant-food, but generally depends upon that of one or two individual substances.

The old theory, that seven elements are always necessary to the full development of a plant, is now exploded; but still, unless proper and suitable food is supplied in sufficient quantity, the plant suffers. If a soil be supplied with a manure containing a very small quantity of one of the important ingredients of plant-food, along with abundance of all the others, the amount of growth and increase which is produced must obviously be measured not by those which are abundant, but by that which is most deficient; for the plant which grows luxuriantly so long as it obtains a supply of all its constituents, is arrested as effectually by the want of one important item as of all.

The engraving in Fig. 11 exhibits the results of an experiment by Professor W. O. Attwater, Director of the Connecticut Agricultural Station, U.S.A. The experiments were undertaken to demonstrate the effect of withholding certain elements of plant-food separately, and comparing each case with an example in which the plant was supplied with every ingredient necessary to its full development. Ten wooden boxes were taken and filled with pure sand, the boxes being numbered I., II., III., IV., V., respectively. In the first five Buckwheat was sown, and in the second five, Oats. To fertilise these, several solutions were prepared by dissolving suitable chemical salts in water. One of these solutions, containing all the ingredients which plants require for building up their vegetable fabric, was called the *normal solution*, and was applied to No. V. of each series. Another solution, containing the same ingredients, except that the constituent of nitrogen was omitted, was used to water the plants of No. IV. A solution, with everything but phosphoric acid, was applied to No. III. of each set. Potash was in like manner omitted from No. II. And finally No. I., of both Buckwheat and Oats, received rain-water only.

The engraving presents to the eye at once the character of growth obtained under these various treatments: the omission of any one of the more important elements of plant-food reduced in a remarkable degree the healthiness and vigour of the plant operated upon. In lack of potash, everything else being supplied, the plants suffered to a certain degree; leaving out phosphoric acid injured them more, especially in seed-production, as may be learnt from the table which follows. Without nitrogen, even though everything else was furnished, the growth was no better than with rain-water only.

When the plants were ripe they were harvested, the roots being freed from sand by careful washing, and the dissected parts weighed. The following table gives the air-dried weights in grammes of both Buckwheat and Oats under the various manurial applications:—

	No. I. Rain-water.		No. II. Without Potash.		No. III. Without Phosphoric Acid.		No. IV. Without Nitrogen.		No. V. Complete Fertiliser.	
	Buckwheat.	Oats.	Buckwheat.	Oats.	Buckwheat.	Oats.	Buckwheat.	Oats.	Buckwheat.	Oats.
Weight of Stem and Leaf	4·9	1·8	14·1	14·9	8·7	11·4	2·9	5·5	25·4	34·5
,, Seed	1·2	0·3	13·0	4·5	4·4	1·3	0.9	1·3	20·4	4·2
,, Roots	4·6	2·3	6·6	7·7	2·4	4·6	4·6	3·9	5·4	17·3
Total Plant	10·7	4·4	33·7	27·1	15·5	17·3	8·4	10·7	51·2	56·0

These experiments teach us that, as a rule, fertile soils, cultivated in the ordinary manner, contain a sufficient store of mineral substances for the production of healthy and vigorous plants; but that the quantity of nitrogenous matters which the plants are capable of extracting either from the air, the soil, or from the natural rain-water supply, is insufficient, and must be supplemented by manures containing them. Ammonium salts or sodium nitrate increase plant-growth by promoting the absorption of other substances already present in the soil.

Water-culture. — The absorption of water by plants takes place in great abundance, and is connected with many of the most important phenomena of vegetation. It has been shown from experiments by Lawes and Gilbert that about 2,000 lbs. of water pass through a plant for every pound of incombustible matter fixed in it.

Experiments in *water-culture* consist in raising plants without any soil at all, but with their roots immersed in water, in which have previously been dissolved, in the desired proportions, the chemical ingredients of plant-food.

The prepared solutions are put into glass jars, and the young plants, from seeds germinated or sprouted in sand, or moist cotton wool, are then taken and suspended from the top of the jars, with their fibrous roots dipping into the solutions, and are thus allowed to grow, proper support being given to the plant as the growth proceeds. In this way plants can be raised as large, as healthy, and in every way as perfect as those cultivated in soil, and they may become not only a source of pleasure and amusement, but of great practical value, as may be gathered from the engraving in Fig. 12 of a series of experiments with Buckwheat conducted by Dr. Nobbe at Tharandt.

The engraving with the explanations show that in the *normal solution*, containing all the essential elements of plant-food, the Buckwheat was robust and healthy, and the best plant (I.*a*) grew to be nearly 3½ feet high. Another plant (II.) grown under precisely the same conditions, except that no potash was supplied, led a starving and sickly life, and attained a height of scarcely three inches. When potash was added at a later period of growth (in II.3) the plant so treated revived, pushed out with some vigour, but was unable to overtake its better-fed neighbours; proving that the water solutions, unlike the sand previously referred to, were entirely unable to supply any constituent beyond what was artificially added to them, but when the proper ingredient in an available form was applied, the solutions immediately became capable of supporting and carrying on the plant to perfect maturation.

Nor did the plants grow well in lack of either lime (IX.) or chlorine (X.) or nitrogen (XI.).

Dr. Nobbe remarks that these are the results not of single, but of many repeated trials, and they all agree in this one general conclusion: that the inorganic constituents of plants are entirely absorbed by the roots; and it is as a solvent for them that the large quantity of water continually passing through the plants is so important. These ingredients exist in the soil in particular states of combination, in which they are scarcely soluble in water. But their solubility is increased by the presence of carbonic acid contained in the water, and which causes it to dissolve substances otherwise insoluble. It is in this way that lime, which occurs in the soil principally as an insoluble carbonate, is dissolved and absorbed.

Phosphate of lime is also taken up by water containing carbonic acid, or even common salt (sodium chloride) in solution. The amount of solubility produced by these substances is extremely small; but it is sufficient for the purpose of supplying to the plant as much of its mineral constituents as are required for healthy and vigorous growth.

THE HARDY FRUIT GARDEN.

By D. T. Fish, assisted by William Carmichael.

THE PEACH AND NECTARINE.

PEACH culture under glass has already been so fully and exhaustively treated, that comparatively little space need be devoted to its culture in the open air. The two methods, while differing in several respects, have much in common. But, first of all, it may be desirable to vindicate the wisdom and expediency of attempting to grow such fruits in our climate without the protection of glass. So much has been written of late years anent the deterioration of our climate, and the hopelessness of perfecting Peaches or Nectarines in the open air, that not a few have relinquished all hope of success. Hence Pears have been substituted for Peaches on walls. Doubtless in many localities Pears are a far more certain and profitable crop than Peaches, and the more Peach-walls are converted into Peach-houses, or glass-cases, the greater the certainty of regular crops of well-ripened fruits. Still, it is needful to affirm once for all that the deterioration of climate rests on no reliable data. The fact that as fine, or finer, Peaches and Nectarines were grown in the open air last year as were ever grown before, disposes of any number of plausible hypotheses advanced to prove that our climate has so seriously deteriorated during the last fifty years as to be incapable of bringing such fruits to maturity. And as to quality,

a very general consensus of practical opinion would be to the effect that the out-of-door fruit were the more rich and luscious.

As to cycles of bad seasons, unfavourable to the open-air culture of the Peach, and other semi-tender fruits, they have been always with us periodically. We read of them in our past records, as well as suffer from them in our present experience. Fickleness and change have been written on our spring weather ever since we have any record of it, either in books or its doings among plants.

Possibly the cheapness and plentifulness of glass in these days weakens and enervates the cultivator as much or more than some of the plants that he grows under it. Still our object is by no means to pit the culture of the Peach in the open air against its culture under glass, but rather to encourage every one to endeavour to command success out of doors. In this, as in most pursuits, it may be affirmed with more rather than less truth, that he will conquer who believes he can.

Though the trees are neither less nor more hardy than they were, nor the climate one whit more severe than it was, yet it may prove a very disappointing tactical and cultural error to treat the Peach or Nectarine as perfectly hardy. Use and wont does not change the constitution, nor affect the hardiness, or otherwise, of the plant. The misreading of altitude originated most of the fallacies of acclimatisation. Climate is determined by altitude far more than by degrees of latitude and longitude, and British zones may readily be found in all quarters of the globe. Hence, and as a matter of course, trees and plants from these zones, whether hailing from Africa, Asia, Europe, or America, thrive almost as well with us as at home.

Importance of Recognising Differing Degrees of Solar Energy.—Due allowance must be made for this in the culture of such fruits as the Peach. For example, the average temperature of a certain altitude in Persia, the reported home of the Peach, may correspond with our own, and yet the sun's energy or force be greatly in excess of ours. Hence the necessity, by the choice of favourable sites, the erection of walls, the covering of the Peach-trees with glass, and other expedients, of making the most and the best of our solar light and heat. Even our methods of propagation, planting, pruning, training, may all contribute to the same result—viz., that of utilising to the uttermost our solar force.

Influence of Site on Climate.—The influence of soil, shelter, and aspect upon climate have been treated of in the case of other fruits, and we only need here enlarge upon the special importance, in the case of Peaches, of choosing the cardinal points, or aspect. To pass from the north to the south side of a wall is often like coming from winter into summer. Peaches can be grown successfully on walls with several points of east from south, and on all aspects from south to due west, yet southern aspects on the most favourable sites yield the best and surest results.

Skeletonised trees, as our Peaches on walls mostly and necessarily are, are subjected to far more light and heat than those of bush, pyramid, standard, or other shapes. While the thinner the wood, and the more bare brick exposed between the branches, the higher the local temperature enjoyed by the trees.

Trees Hardier than Flowers and Young Fruit.—Not a few failures arise from the overlooking of the above fact. The Almond (twin brother to the Peach), the double Peach, and even fruiting varieties, are often planted in shrubberies, and thrive well, and bloom freely. In favourable localities Almonds not seldom ripen their fruits. Neither are Peach-trees on garden walls often seriously injured by the cold. For one tree crippled or destroyed by frost, a score—fifty even—are ruined by the aphides. But while the *trees* escape injury, the *bloom* is not seldom swept off, or destroyed. What has been said elsewhere as to high and low localities will here specially apply, for Peach-blossoms are blasted by spring frosts in the troughs of valleys, while those planted upon rolling, broken, and higher ground escape. The tenderness of the Peach-bloom, as well as its earliness, also suggests the wisdom and necessity of providing them with some extra protection against those accidental and abnormally severe frosts that prove so trying and discouraging to the Peach-grower in the open air. Peach-blooms can hardly be trusted to endure with impunity more than from five to eight degrees of frost, and they mostly open their blooms in the last fortnight of March, in which we not seldom have from twelve to eighteen degrees of frost. However, in calculating our chances of success, the ameliorating influences of cultivation and of shelter must not be lost sight of. All such influences combined will amount to an average advantage of from five to ten degrees in favour of the cultivator.

Mean Temperature of the Earlier Months of the Year.—Though we cannot control accidental temperatures, we can select our means of the months, and unless the mean of March, in any given place, approximates closely to 45°, of April to 50°, May 55°, June 60°, July and August 60° and 65°, it will hardly be possible to grow Peaches to the highest perfection in the open air. Under skilful

treatment, and with such temperatures, the fruit would be ripe in September. Peaches under glass, or under any forcing conditions on walls, may be finished in a little more than four months from the bloom. But in the open air it takes five months as a rule, and sometimes nearer six. A good deal depends on local circumstances, and also the latitude of the place. The best latitude for the Peach may be found within the ten degrees included between 35° and 45°. Beyond a latitude of 50° the earth is too cold for the roots of the Peach, under one of 30° the air is too warm for its top. Being deciduous it cannot be grown to perfection in tropical climates, and does best in the temperate latitudes of Europe and America. It is a curious fact, that one could hardly have anticipated, that the fine-looking French Peaches are by no means equal in flavour to those grown in the open air in England.

Like all other trees and plants, the ability of the Peach to resist cold is largely determined by the maturity, or immaturity, of its wood. The riper the wood the hardier, and *vice versâ*. And, singularly enough, the flowers on ripe wood being stronger, seem to have more power to resist cold than the weaker ones, on unripe wood, and thus culture may add to the hardiness and consequent safety of the bloom of the Peach in the spring.

Retarding the Period of Blooming.—As we have seen that its early blossoming is one of the chief causes of danger, it follows that if the bloom can be kept back there is a much better chance of obtaining a full crop. Among such means the following deserve consideration: the raising and cultivation of later-blooming varieties; the later pruning of existing sorts; the detachment of the trees from the walls in winter; the working of all Peaches for the open air on Plum-stocks, and on later varieties of Plum; root-pruning; frequent lifting, and partial shading.

As regards the raising of late-blooming varieties, nothing seems to have been done in this special direction; and though much earlier and later Peaches have been added to our collections, comparatively little has been done to alter the season of blooming.

Late pruning, deferring it indeed until the blooms have set into fruit, retards blooming considerably, and does not result in any serious consequences in the case of the Peach.

Detachment from the wall by unnailing the trees, and tying the branches up to stakes a yard or more from it, will retard the blooming period by a fortnight or more. It has also other advantages, and if done the moment the leaves fall, helps to more thoroughly ripen and mature the wood. By thus detaching the trees, the wall is exposed to the winter frosts, and unusual facilities are afforded for its thorough cleansing and repair. The plan involves no risk of injury to the trees, which, in a dormant state, bear the severities of our climate with impunity. But should a winter of unusual severity, that is, frosts ranging from 20° to zero ensue, nothing is easier than to throw a mat over, or wind a wisp of straw round the trees. The only objection to this most effective method of retarding the blooming of Peaches in the open air, is the extra labour it involves. But the greater cleanliness, and more thorough maturity, and overhauling of the trees, sufficiently compensate for this; while a full crop of fruit is not seldom the result of this detachment of the trees from the wall for four months out of the twelve.

The relation of stock to the fostering or retarding of growth on the tops of fruit-trees has not received the attention it deserves.

In this country Plum-stocks of some sort are the most generally used, though on the Continent and in America the Almond and Peach are more popular. The chief objection to the Plum-stock is that it does not keep pace with the Peach, and the latter overlaps the stock so as to form a large knot or wart at the point of union, and the wart not seldom becomes an active centre of canker and other diseases. But the Plum-stock is more desirable than the Peach, and thrives better in our cold soil. Were later varieties of the Plum used, such as the Ickworth or Blue Impératrice, Golden Drop, Late Gage, Belle de Septembre, Wyedale, Autumn Compôte, Grand Duke, and Late Rivers, it might be quite possible to retard the blooming of Peaches and Nectarines in the open air till the middle of April; and this gain, or rather loss, of a fortnight or three weeks in the time of blooming would, as a rule, save the crop.

For modes of working the Peach, &c., see THE PEACH AND NECTARINE UNDER GLASS. It may, however, be added here that budding is preferable to grafting for Peaches and all other stone fruits, as it necessitates the making of fewer and smaller wounds, and the less these are wounded, wood or bark, the better, as wounds are apt to beget gum and canker, two of the worst evils that can afflict the Peach or Nectarine in the open air.

Root-pruning, to have a retarding effect, should hardly be performed until the middle of November. If pruned too early, the roots will get so thoroughly established before winter, that the trees may bloom as early as if they had not been disturbed. But late-pruned roots fail to forward the same amount of supplies throughout the winter, and the trees bloom later in consequence.

Frequent lifting is even more effective than root-pruning, inasmuch as it prunes and detaches every root from the soil; and this separation of course

causes a loss of time as well as of growing force, and hence ultimately a loss of sap, and consequently later bloom. This is not a matter of theory, but of experience; a clear loss of a fortnight, not seldom more, is often noted as a result of transplantation, and in this case the loss of time is all in favour of the gain of a crop of fruit.

Any one who has ever stood or worked against a south wall on a clear sunny day in March, or even in February, will be prepared to acknowledge the potency of artificial shade, and to marvel that it is not more generally used. The fact is, *heat in excess in the spring works more mischief than cold.* It is the heat that stimulates the fruit-buds into an injurable condition; hence, the wisdom of shading them from the heat of the sun is even more conspicuous than that of sheltering them from the frost. And the same means rightly used will do both.

In the use of canvas or such fabrics for shade, however, there must be free ventilation behind, and especially at the top of the screen, else they will but add to the heat by accumulation instead of intercepting it. Experience proves that the blooming period may be deferred by several weeks through shading.

Protection against Cold.—When all that is possible is done to retard the blooming season, the precocity of the Peach and Nectarine still constitutes one of their chief dangers in our climate. Their naked blossoms are unequally matched against our severe frosts, cold rains, and battering snow and hail storms; hence the necessity, especially in unfavourable localities, of special protection during this treacherous season.

Among some of the more efficient means of protection, are thick-panelled, winding or recessed walls, wide copings, screens of canvas, bunting, mats, boughs, portable boards, glass, nets, bracken, straw, reeds, asparagus-tops, &c. The practical difficulty in the use of opaque coverings consists in the fact that while they conserve warmth, they also shut out the light, and the exclusion of light renders the trees so much more tender, that practically the effects of protection are nil. The kernel of efficient protection lies in the simultaneous conservation of as much heat, and the admission of as much light, as possible.

Walls.—Walls, and especially brick walls, nine, fourteen, or twenty-one inches in thickness, are very efficient protectors. They absorb much heat by day, and give it out slowly by night. Their natural colour is, on the whole, the best. By painting them black, they become much hotter by day and cooler at night. By painting them white, there is a loss of heat alike by day and night. From ten to twelve feet are good heights for Peach walls, though they may be met with fourteen or more feet in height.

Partly for economy of material, and ornament and protection, Peach walls have occasionally been built in waving or curved lines. Bold curves of ten or twelve feet on the southern side, with curves half the size on the north, place each Peach-tree in a warm bay. By placing a cordon Pear or other tree at the extremity of the bay, the protective power of such walls is increased. The wind that often sweeps the face of straight walls to the great injury of the trees, is caught and broken by the projecting cordons, and the Peaches in the bays are passed over untouched. Pillared or panelled walls, or walls with buttresses at intervals of twenty feet or so, have similar though less potent protective powers. The protective power of straight walls may also be strengthened by running up Apple, Pear, or Plum cordons between the Peach and Nectarine trees.

It seems singular that heated walls have almost gone out of fashion. By building hollow or flued walls, it is an easy matter to baffle the frost on its own chosen ground—the Peach or Nectarine trees in bloom. It is astonishing how very little heat in flue or hot-water pipe suffices to preserve the trees from injury during cold, clear nights; and should the heat in the walls be further husbanded by slight coverings, Peaches and Nectarines may be successfully cultivated in hundreds of gardens in which it is hopeless to attempt them without such assistance. Hollow walls have also merits of their own, besides the affording of facilities for warming by flues or pipes. They heat and also cool more slowly than solid ones, and it is difficult to say which is the greater merit in the culture of the Peach in the open air.

Wall Copings.—The copings of garden walls should always project about three inches on either side. The coping should be raised in the middle, and a groove run along the under edges a half or three-quarters of an inch from the sides. This groove cuts the drip, as practical men describe it, and sends it to the ground, clear of the trees, thus tending to keep them dry when in bloom, and this helps to protect them from cold, as it is well known that wet flower-buds or blossoms suffer sooner and far more severely from frost than dry ones. However, such copings can do but little to conserve the heat of the wall. To do this effectually, copings of a foot, fifteen, or eighteen inches are needful. But these, if too wide, prevent the dews and rains from reaching the trees, and probably do more harm than good.

Hence the origin and use of portable copings for employment during what may be called the danger period of our springs. These are formed of slate, wood, thatch, mats, glass, &c.

Opaque copings of such width must be portable; the glass ones may be permanent, though they, too, are most efficient when put on in March and removed in May. Glass, however, while possessing the great merit of transparency, is far less efficient as a heat-preserver than wood, thatch, or even slate.

Glass copings have been extended until they have been converted into glass walls, and these hardly differ, unless in their width, being mostly narrower, from the Peach-cases already described in The Peach and Nectarine under Glass. As glass copings offer but slight resistance to the radiation of heat from the walls, during clear frosty nights it is safe practice to increase their efficiency by coverings of mats in severe weather.

Portable wooden copings, consisting of narrow shutters, of two or more nine-inch or foot deals slipped under the permanent copings, and fixed to sloping iron brackets, form most efficient cold-proof portable protectors, as thin planks, or inch deals, are practically impervious to the passage of heat. A thatch of reeds, straw, rushes, or coarse grasses, from six inches to a foot in thickness, is equally impervious, and is much used in France as a temporary coping for protective purposes.

These mats roll up by day, and are replaced at nights. No interstices must be left between the upper side of the coping and the wall, as otherwise the heat will escape, or the cold rush in behind and sweep off the bloom, notwithstanding the thickness and efficiency of the copings. The temporary copings should have a sharp pitch, for the double purpose of draining themselves dry quickly, and also keeping the trees and the base of the wall dry.

Should the Peach-blossom get frozen the safest remedy is a gentle sprinkle, several times repeated —for too much at once, or applied too violently, is fatal to success—of quite cold water an hour or two before the sun hits them. The water draws out the frost gradually, and so the blooms are saved. The blooms are more frequently destroyed in the thawing than by the freezing, and hence the *rationale* of the cold-water cure. But prevention is better than cure, therefore, in unfavourable seasons or localities, protection may be carried much further by screening the whole front of the walls with thin canvas bunting; woollen, or other netting; rough straw bands, with long straws projecting, stretched on poles, placed within a foot of the walls, the ends of one band almost touching those of the next; a thin thatch of Spruce, Yew, or other boughs; Bracken, or Asparagus-tops, on the wall itself; or any other substance or means of checking the energy of radiation, and so husbanding heat, and saving the bloom from destruction. Bunting, or canvas, made portable by suspension on rings, or rollers, to be promptly removed, and placed over the trees at pleasure, is, on the whole, the most sure and satisfactory arrangement for protecting the trees against the two extremes of heat and cold.

Great benefit is also often derived from protecting the stems and even the main branches of Peach-trees in the early spring. The sun often fills both to repletion with a rising tide of sap, and should this be frozen at night, ruptures of bark and wood, resulting in disease and death, frequently follow. A loose straw band twisted round the stem, and continued to the chief and most exposed portions of the side and main branches, would render such incidents impossible, and also keep the main limbs and trunk of the tree much cooler during bright days.

Were climate constant in the open air, there would be nothing to add to Mr. Coleman's articles, and for most details of culture we refer to them.

Planting.—A dry bottom is, of course, vital. Where the soil is naturally wet, the best plan is to raise the border right above the natural level of the ground, and to make sure of the roots not penetrating the wet earth, concrete the old surface before forming the border, and place at least six inches of drainage over the concrete. Of course this is in extreme cases; where the subsoil is porous, or can be readily drained, the original soil may be removed, and the borders made either perennial, or at once, as pointed out in The Peach and Nectarine under Glass.

As gross growth is far more difficult to deal with out of doors than in, none of the stimulants, such as bones, &c., recommended for "Peaches under Glass," should be added to outside borders. Good loam, assisted when the trees get into full bearing with mulchings, and liquid or solid manure if needful, will prove sufficient. As to depth and width of border, that may vary according to rainfall of locality, height of wall, character of trees grown, &c. For full-sized fan-shaped trees, borders two feet deep, and the width of the height of the wall, are a safe mean, and have yielded better and more durable results than any other. On dry soils and subsoils, a border three feet in depth may not prove excessive; while in damp localities, on stiff subsoils, eighteen inches deep would be more likely to result in that moderate-sized, thoroughly matured, nut-brown wood desired by the most successful Peach-growers. Strong vigorous wood may at times be an advantage in-doors, where heat to finish it is at the disposal of the cultivator. But in the open air no more nor stronger wood should be made than can

be thoroughly ripened before the end of the season. Hence the importance of using fleet, and what might be called rather poor, than rich borders.

Having made the borders, one or several months previously, as described by Mr. Coleman, and allowed the border time to settle down, the best time to plant Peaches in the open air is from the middle to the end of October. Especially is this early planting important when the trees are near at hand, or in the same garden. It is so much of an advantage, indeed, to have the trees thus on the spot beforehand, that all who intend to grow Peaches to any large extent should order in their trees the year before, and plant them out in the open, or against any blank spaces of fence or wall. Here they might be moulded into form, and even encouraged to make a moderate growth. In the following season they might be removed into properly prepared borders, placed in their permanent quarters, and if transplanted early, and with ordinary care, they will gain much, and lose nothing, by their second removal.

Distance Apart.—This may vary from six feet to twenty, according to the form and size the future trees are to grow into. The first is best for cordons, the second a good distance for full-sized fan-shaped trees. But as it is well to have sufficient root-force, fan-shaped trees may be planted as close as ten to fifteen feet asunder; and in practice these distances are reduced to one-half, by placing between each permanent tree a rider, or taller-stemed tree, to furnish the top of the wall, while the dwarf, as it is called, is more gradually occupying its allotted space below. Generally, too, the lower the wall the closer the trees are placed to each other. For example, on a wall seven feet high, nine feet would be sufficient distance; but on a wall fourteen feet high, eighteen feet might prove all too close. Largish trees are also the most fit for open-air culture; they seem hardier and more fertile than cordons, or very small trees. These are not, in fact, to be recommended unless in very warm localities.

Two points are essential to success—these are maiden trees and maiden soils. To plant trees, and grow them into size before planting, is all very well, and may save a year or more in the furnishing of the wall; but for amateurs to purchase trained trees from the nursery, and have them transported, perhaps, for several hundred miles, is almost to invite failure. Maiden soils are still more vital to success than maiden trees. Soils soon get Peach and Nectarine sick, and on no account should young trees ever be planted in the old soil on the old borders. As it is mostly needful to grow Peaches on the same walls, the soil and drainage should be excavated to the depth of a yard, the drainage cleansed, re-laid, and fresh loam, or earth, substituted for the old soil of the Peach border.

Depth to Plant.—The Peach, more than most trees, is impatient of having its collar soil-logged, hence on no account should the original earth-line on the stem be lowered. The roots also thrive best within a few inches of the surface, and should never be covered over with more than three to four inches of soil. Over this they should have two or three inches of some porous material, such as cocoa-fibre refuse, half-decomposed manure, or litter, to exclude the frost from the roots during winter.

As trees are cheap, and time and wall-space valuable, it is good practice to plant two or more temporary trees between each two permanent ones, as the first crop off the latter will more than pay for them. These may be cut away as the others grow, and finally give place to larger trees.

After planting the trees should be loosely and roughly tied to stakes. Nothing can well be more injurious than the usual practice of tacking them up against walls when first planted. The earth necessarily subsides, carries the tree with it, and these being made fast to the solid wall, the roots are strained or torn off in consequence. Roots and tops should be left intact at planting, the only pruning allowable being the removal of any badly bruised or broken parts. Unless the soil is abnormally dry, or very dry weather ensues, no water should be given. In the autumn, in the open air, any soil or site suitable for the growth of Peaches will be sufficiently moist to foster the development of new roots.

Pruning and Training.—Little need be added to what has been so fully described in The Peach and Nectarine under Glass. The time of pruning may need to be altered, but its principles and practice are very much the same outside and in. There is, however, this very wide and broad distinction. The out-of-door pruning of the Peach is largely controlled by climate; its pruning in-doors is almost independent of it. In pruning out of doors we must ask how much wood the climate is likely to ripen within a given time.

As the science of cultivation becomes more perfect, pruning becomes more continuous; it is less severe and more frequent, and consequently more difficult than it used to be. The distinction between the winter and summer pruning of the Peach is still preserved, but that is nearly all that modern pruning retains in common with the older methods. The time of winter pruning is now very generally delayed till March, instead of being completed at the fall of the leaf, in October or November, and it is not carried to anything like the same extent, only the

tips of the shoots being cut off, and the major portion of those left to produce fruits and succession shoots. As the trees enlarge in size, and occupy most of the space allotted to them, more and yet more old and semi-exhausted wood will be pruned out at the winter pruning. This operation should be performed so soon as the fruit is gathered, for the double purpose of enabling the wounds to heal before winter, and afford more light and air to have free access to the wood left.

Returning for a moment to our newly-planted tree, it will probably be found in full flower in March, with wood-buds also showing regularly from base to summit of the shoots. If not more than a foot or two in length, and it is breaking right back to the base, the shoots may have any imperfect or frost-bitten ends cut off, and be trained into form, the pruning being a mere overhauling, and transferring, now the soil has subsided, from the stakes to the solid wall. Permanent trees will probably need even less winter pruning. By the month of March the frost will have mostly done its worst, and the pruning consists very much in a neat clearance of the winter injuries and wreckage. Of course, very much depends on how well or ill the summer pruning had been attended to. If that had been perfect, and the winter genial, no winter nor spring—that is, deciduous—pruning of the Peach should be necessary.

Summer pruning, unlike the winter pruning, is less a single act than a series of processes or "little goes," throughout the season, from May to November. Some even begin earlier than May, but it is well to allow the whole of the wood-buds on the Peach and Nectarine, in the open air, to break and make a good start before beginning summer pruning. The process is known by various names, such as disbudding, pinching, and stopping.

Stopping and pinching mean the same thing in fact, with a difference in regard to time. Pinching, not needing a knife, takes place earlier than stopping. Unless for the more rapid or perfect forming of young trees, or furnishing with new and vigorous wood dilapidated old ones, the pinching of Peach-shoots in the open air is not to be recommended.

There is also another period when pinching may be resorted to without injury to the trees, and with positive benefit to the size and flavour of the fruit, and that is, to pinch the end of the fruiting branch a month or so before the fruit ripens. But to pinch in June or July is more likely to result in a crop of succulent shoots, to furnish food for the first frosts, instead of crops of luscious Peaches for the cultivator. Summer pruning consists in the removal of all superfluous shoots, laterals, &c., throughout the season, leaving nothing to ripen that will not yield fruit, or shoots where the latter are needed.

Pinching is also practised for another purpose—the development of fruit-spurs. Instead of disbudding in the usual way, pinch out the wood-shoot early in the season, leaving two leaves at its base. These pinched-back shootlets will mostly develop a new fruit-spur before the autumn. For particulars of all this see THE PEACH AND NECTARINE UNDER GLASS.

The common fan, or Seymour's, system of training the Peach in the open air has never been bettered.

None of the systems of fancy training so common on the Continent are suitable for our climate, and if anything approaching to cordons are tried, the U or such simple forms are likely to prove the more successful. Whatever mode of training is adopted, the object should be to clothe the wall as speedily as possible without allowing the strength of the trees to run unduly into their heads. A reserve force of sap, and supply of succession shoots, should always be reserved near to the base of the trees. This is the result of skilful pruning as well as of good training.

Root-pruning.—For full-sized Peaches in the open air this is comparatively seldom needful. The *modus operandi* has already been described with sufficient exactness. In low-lying localities and climates unsuitable for the Peach, success may often be commanded by mound-planting, and pruning the roots or lifting the Peaches every year, or biennially. If carefully performed early in October, the trees will receive a wholesome check, but not sufficiently violent to hinder them bearing fruit the following season. Peach-trees, especially when thus treated, produce quantities of fibrous roots that enable them to re-establish themselves with great rapidity after the disturbance of root-pruning, or after lifting. Peach-trees, however, are lifted at times to encourage as well as to check growth. Debilitated by age, over-cropping, or unskilful treatment, the roots may be lifted, the old soil of the border removed, and fresh compost substituted for it, the roots laid in or on the fresh soil, and lifted nearer to the surface, and by such simple expedients the life of many a Peach-tree has been saved, its youth renewed, and its last days rendered more fruitful and profitable than its first.

One caution needs to be given here, and that is against the use of *leaf-mould* in these processes. Thousands of Peach-trees have been wrecked by the introduction of leaf-mould against the roots. Peach-roots need no such aids to growth, while the leaf-mould is almost sure to develop a full crop of fungus, to the contamination of the soil, and the poisoning of the roots. Leaf-mould should be

shunned as a mulch, and on no account admitted as a constituent of a Peach-border in the open air.

These modes of resuscitating semi-exhausted trees are far less practised than they were, now that young trees have become so plentiful and so cheap, though only those that have succeeded in re-establishing the health of an old Peach-tree, can have any idea of the enormous crops it will yield, of the highest quality.

General Culture.—Properly sheltered, planted, trained, pruned, and fed, there seems little more to be done for the Peach, or other fruit. But all this might be done, and yet the cultivator fail, for lack of attention to a few other matters hardly of secondary importance, such as thorough and regular watering, when necessary, of the tops as well as the roots; the setting, thinning, swelling, colouring, and flavouring, and gathering of the fruit; the ripening of the wood; and the winter treatment of the trees.

As the Peach can only be successfully grown on a porous and well-drained border, there is little danger of over-watering it during the growing season. The finest wall of Peaches and Nectarines ever seen by the writer in England had just had a stream of sewage running over it for twenty-four hours, and a similar flooding of water once a week or ten days, throughout the growing season. During hot weather, too, a deluging over the leaves on the evenings of hot days is of immense advantage.

Setting of the Fruit.—It may be thought that the cultivator has little power over this in the open air in March. But he may contribute towards it in two ways—by moistening the flowers in very dry weather, and distributing the pollen on to the stigmas. A gentle dewing over about 9 a.m. during dry weather, when the thermometer is not lower than 40°, assuredly assists in the setting of the fruit. And as neither flies nor bees are abroad in March, the imitation of their touch on the blooms with a light hand or brush, at least partially does their work, and sets the bloom.

The Thinning of the Fruit.—Almost as soon as the blooms have developed into fruit, go over them, and thin and throw off all malformed, awkwardly-placed fruit. In a month or so go over them again, and take off dual fruit, and thin out those clusters that may have escaped before.

Then leave the matter till the fruit are stoned, a process that not seldom thins the crop rather more than is either desired or expected. When the stone is sufficiently hardened to hinder a knife from passing freely through it, give the final thinning. To have first-rate fruit the Peaches should hardly be closer than an average of six inches. In practice they vary as widely as from two to twelve, and it is this that prevents the thinning of the fruit to anything like mathematical exactness.

Ripening of the Fruit.—Peaches, and most fruits, have what are termed two swelling periods. The first begins with the setting, and ends with the hardening of the stone of the fruit, or, more correctly, about a month or six weeks before that is accomplished, for during the conversion of the stone from a substance almost as soft as the other portions of the fruit into a substance as hard as we are familiar with in the ripe fruit, the size of the Peach remains stationary. During the first swelling it is no use to apply any stimulating treatment to the soil, an occasional leaf-and-branch sprinkling being sufficient. But during the second swelling it is quite otherwise. So soon as Peaches and Nectarines are securely stoned, their tenure of the tree is insured until they are ripe. From thence there is no further danger of their falling or being washed off. Consequently mulchings of solid and liquid manure may be freely used during this period, for the enlargement of the fruit.

Full exposure to the light is the surest mode of laying on colour, and laying in flavour, to Peaches and Nectarines, and other fruits. In pursuit of these highest objects of a good finish, all superfluous shoots, and even leaves, must be removed or pushed aside. It is certain that Peaches and Nectarines will not lay on a full share of colour, or develop the highest qualities, if overhung with leaves, or shaded with lateral or other shoots. All stimulating treatment and foods should also be withdrawn a full month before the fruit ripens.

Gathering, serving, and packing the fruit have been sufficiently treated of by Mr. W. Coleman.

The Wood.—Alongside of the special culture of the fruit runs constant care of the wood of the Peach. The rules of stopping for wood and fruit have been clearly laid down in The Peach and Nectarine under Glass. Out of doors incessant tying-in, the removal of lateral and supernumerary shoots, proceed throughout the season. The nearer the wall the greater warmth, and close and frequent tying prevents the shoots from overshadowing each other and the fruit. With the view of stimulating root-action more wood is also laid in during the earlier stages than can be accommodated as growth proceeds. Hence the necessity of stopping some shoots and totally removing others to prevent overcrowding. Great care is also needed to prevent either ties or shreds from biting into the shoots. All ligatures, alike in the old and the young wood. but especially

on the latter, should be frequently examined, and wherever they are pinching the wood, removed, and larger ones substituted, as tight ligatures are a fruitful source of gum and canker in the Peach.

Cleanliness.—This does not only include the destruction of all insect pests, for which see INSECTS AND DISEASES, but the removal of all dust, soot, and other dirt alike from the walls and the trees. This is the more needful where Peaches are grown in the vicinity of dusty roads or towns. Frequently success is baulked by mere physical pollutions, which a diligent use of the hose from the water-main or the garden-engine would have easily got rid of. Peach-leaves are specially porous as well as thin, and consequently suffer far more from soot and dust than those of most other fruits, such as Apples, Pears, or even Plums.

Best Varieties for Open-air Culture.—A good selection of varieties for culture under glass has already been given, and most of these might also be grown with equal success in the open air, with the exception of a few of the latest and the earliest. It may be useful, however, to many readers, to give the following select list of Peaches and Nectarines for the open air, selected by Mr. Carmichael, whose trees and fruits in the Royal Gardens at Sandringham were probably the finest in the United Kingdom.

SELECT LIST OF PEACHES.

Abec—fruit medium size. A valuable early melting Peach of delicious flavour. Middle of August.

Alexander — fruit large, handsome, and richly coloured; flesh juicy and sweet. This is an American variety, and ripens very early on the wall. Middle of July.

Alexandra Noblesse — fruit very large, handsome, and excellent; a seedling from the old Noblesse, retaining all its good qualities, more robust in growth, and not so subject to mildew. End of August.

Amsden June — this is another very fine, early, American Peach.

Bellegarde—fruit large and highly coloured; rich, juicy, and vinous, and very excellent. Middle of September.

Dr. Hogg—fruit large, melting, and rich; tree vigorous, hardy, and prolific; a first-rate sort. Beginning of August.

Dymond — fruit large and excellent. This is a very hardy Peach, and bears abundantly on the wall. Middle of August.

Early Grosse Mignonne—fruit of a medium size, very juicy, and richly flavoured; a valuable early Peach. Beginning of August.

Frogmore Golden — fruit medium size, very handsome, and richly coloured; tree very hardy and prolific; a valuable variety, of exquisite flavour. This is one of the very best yellow-fleshed varieties grown. It was raised by Mr. Ingram, of Frogmore. End of July.

Grosse Mignonne — fruit large and highly coloured, and excellent; a fine old mid-season Peach. September.

Hale's Early—fruit large and highly coloured, and of excellent quality; ought to be extensively grown. This is another American variety. Ripe at end of July.

Marquis of Downshire — fruit large and highly coloured. This variety was raised by the late Mr. Standish, and is one of the very best late Peaches grown, and very valuable. October.

Princess of Wales — fruit very large and handsome, cream-coloured; an excellent late Peach. End of September.

Royal George—fruit large, melting, and richly coloured; a favourite old Peach. End of August.

Sea Eagle—fruit very large, pale in colour, and of good quality; a fine late Peach. End of September.

Stirling Castle—fruit large and very highly coloured; very juicy, melting, and richly flavoured. This fine Peach was raised at Dunmore Park, Stirlingshire. The tree is hardy and a great bearer; it forces well, and is one of the best. Beginning of September.

Teton de Venus—fruit very large and richly flavoured; a very fine late Peach. Ripe at end of September.

Tippicanhoe—fruit medium size, pale colour, and very handsome. This fine American Peach is a good and abundant bearer, and fine-flavoured. August.

Violette Hative—fruit large, melting, rich, and excellent. The tree is hardy and prolific. Middle of September.

Walburton Admirable — fruit large and richly flavoured; a fine late variety. End of September.

SELECT LIST OF NECTARINES.

Albert Victor — fruit very large and handsome, melting, and good. End of August and September.

Elruge—fruit medium size, melting, juicy, and richly flavoured; a well-known variety. End of August.

Galopin—fruit very large, pale colour, very rich, and sugary; a fine variety. End of September.

Humboldt—fruit large, handsome, and richly flavoured. The trees bear abundantly; a fine variety. September.

Lord Napier—fruit large and handsome, melting, rich, and excellent. The best of the early varieties. Ripe early in August.

Murray—fruit medium size, an excellent variety and a good bearer; fine dark bloom. August.

Victoria—fruit large, rich, and sugary; a valuable late variety. End of September.

Violette Hative — fruit large, richly flavoured, and handsome; one of the best. End of August.

Insects and Diseases.—Most of these have already been treated of in the in-door culture of the Peach. Various contrivances have been suggested and invented for fumigating plants and trees in the open air, but none of them have been sufficiently convenient and efficient to warrant their recommendation with confidence. Outside or in, prevention is better than cure, and there are few better preventives than the use of a smothering and poisoning smear or paint, which are mostly composed of various proportions of clay, cow-dung, and sulphur, made into a paint with strong decoctions of Gishurst compound, tobacco-water, or quassia-chips. The constituents of such smears are of less moment than their stickiness and thickness. They smother rather than poison, though some add *nux vomica*, to make sure of sustaining their latter quality. To be efficient the whole tree must be painted over, working the mixture into all holes and crevices.

Should aphides appear in spite of such precaution, lose no time in syringing the tree with tobacco-water, or dredging the aphides over with fine dry snuff, when the leaves and branches are wet. Quassia-chip tea or ammonia tea, the latter in the proportion of an ounce to the gallon, will also clear off the aphides.

For red spider the cold-water cure mostly suffices in the open. Apply it in force and violence twice a day through the garden-engine, and the spider will disappear. Soap and sulphur are also effective alike as preventives and cures.

Copious root-waterings, should the borders be dry, will also help the trees to grow out of spider. For the cure of brown scale and thrip, there is nothing to be added to what has been advised for the destruction of the same pests under glass, only that heavy dressings of soot and strong decoctions of soot-tea—the strength of the soot seems better drawn out when a fourth of quicklime is added to the soot—are an excellent preventive, and a good cure for thrip on the Peach. It mostly originates in extreme dryness at the roots, or heat on the tops. Over-cropping and exhaustion also induce thrip and red spider.

There are a good many insects and other pests that attack the Peach in the open air, and are hardly known under glass. A few of these prey upon the leaves, branches, or flowers, and others attack the fruit. Among the first is the red-legged garden weevil, *Otiorhynchus tenebricosus*, which preys upon the roots, buds, leaves, and young shoots. The best remedy is to search for them at night, secure and destroy them. The soil could also be removed for a few inches round the stem and burned, as they bury themselves during the day. The caterpillar of the Figure 8 moth, the Plum-tree chafer, and the grub of the Peach saw-fly often work sad havoc on Peach-trees, unless eagerly sought for and promptly destroyed. Very fortunately, the last and worst of these grubs, that of the Peach and Poplar saw-fly, *Tenthredo populi*, makes its home by spinning a web among the leaves. These are easily seen and picked off, and the grubs thus destroyed.

Among the insects or vermin that prey upon Peaches and Nectarines on the open wall, the following are the most troublesome:—Earwigs, ants, woodlice, black-beetles, ladybirds, wasps, hornets, bees, blue-bottles, butterflies, mice, rats, squirrels, birds, and fowls. The first must be trapped by placing reeds or Bean-stalks with one end beneath the branches. The earwigs, after feeding, will creep into these for shelter, and must be blown out into a cold or hot bath in a jug or pail, every morning. Perseverance in this simple mode of destruction soon clears the tree of these troublesome pests. Ants are often far more destructive than earwigs. It is a popular error to welcome them as allies in clearing the trees of aphides. They simply milk them dry and carry them to new pastures, and thus increase the plague of aphides. Traps of sugar and arsenic are destructive to the ants, but dangerous. Smears of oil, when they allure, destroy the ants, or render them harmless, but they are not very effective against the counter-attraction of luscious Peaches. The surest remedy is to water them out of their nests by boiling water where the former are not among the roots, with strong manure or guano water where they are. The conversion of their runs or nests into swamps either fixes them in, drives them out, or kills them.

Wood-lice are seldom troublesome unless on old walls. The best traps are small garden-pots with a bit of moss placed over a piece of Potato in the bottom of the pot. The wood-lice run into these for food or shelter, and then remain to sleep or rest. By emptying the pots every morning wood-lice may be cleared off. The same traps are best for black-beetles and ladybirds. The latter, however, are seldom very troublesome, and then they are easily caught on the feed. But, unless very numerous, they do as much or more good than harm by eating aphides.

As to wasps and hornets, the nests of these must be destroyed, and these, and bees, bluebottle-flies, and butterflies must be trapped in bottles of various shapes, baited with beer and sugar. Bees seldom attack Peaches in force, but when they do they are very destructive, and must share the fate of others. A useful wasp-trap is formed of two hand-lights—the first raised on a brick at each corner, the second placed over the first. One or more squares are left out, or holes made in the head of the lower light. The ground under the bottom light is then baited with a few pieces of Peach or other fruit. The wasps and hornets enter freely to feed, fly up to the top of the light, pass through the opening between the two, never return, and perish by wholesale of heat or suffocation.

Mice, rats, squirrels, and birds must be kept down by trapping, and the latter two may be netted out, though squirrels make short work of the nets with their sharp teeth. A pair of squirrels will also speedily clear a large tree of Peaches, as they not only eat rapidly, but carry them away wholesale. Fowls and pheasants must be driven or scared away. Once either get a taste for Peaches, it is most difficult to keep them from them afterwards. In addition to these, snails and slugs occasionally put in an appearance, but as these leave tracks behind them they may be easily traced and destroyed. Their lairs should also be rooted out, and dressed with quicklime.

Diseases of the Peach.—*Gumming* and *Mildew* have already been treated of in The Peach and Nectarine under Glass.

Blister results in the swelling, distortion, and complete destruction of the functions of the leaf. As blistering is almost unknown under glass, there

seems little doubt that the cause is atmospheric, in sudden and severe changes of temperature. Careful culture, and prompt protection, are some of the best preventives; cure there is none. And yet some affirm that trees dressed annually with a smear compounded of sulphur, lime, tobacco-juice, and soft-soap, with an ounce of nux vomica to twelve gallons, never have blisters, while those not so dressed beside them have. This can hardly be said to be proved, but it is worth trying. Pick off the blistered leaves, and encourage the trees by surface sprinkling, mulching, &c., to make fresh growth, that is, new and perfect leaves, as soon as possible. *Honeydew* is often found associated with blister, and some consider it a disease rather than, as it is generally thought to be, an after-effect of aphides. As it is, however, universally associated with the attack of these insects, it is believed to proceed from the punctures they make in the leaves. The sap exuding from these, and becoming sweet, forms what is called honeydew. The best remedy is persistent washing with the garden-engine until the honeydew disappears. *Sunstroke* is rather common in some seasons and districts. It mostly occurs during several days or weeks of bright sunshine. Occasionally it affects the leaves, burning or scalding them into white spots, or irregular blotches. But more frequently it affects the young wood, and at times the older shoots, and even stems. Dryness at the roots, and excessive heat on the bare branches, aggravate, if they do not produce, sunstroke. Hence watering or partial shade will be found the best remedy. The wisdom of winding hay-bands, or other substances, round the boles and leading shoots of Peach-trees, has been referred to. But a better mode still is to keep up a succession of young shoots close to all the bare boughs, and even train some of them over the boughs for shade. Should they not be wanted for furnishing afterwards, they may easily be cut off and removed. *Canker* is far less prevalent among Peaches than among Pears. Still, sunstroke and gumming not seldom produce a state of wood and bark that can hardly be otherwise described. The best means of checking it is to cut off most of the hard cracked wood and bark, and dress the wounds with a thick smear of clay and cow-dung.

Root Fungus is most prevalent in dry light soils. It is often produced by the use of leaf-mould in planting. At times, however, the soil of certain deer and other parks seems to favour its production, and the whole substance of the border gets filled, and the roots enveloped, with the mycelline of the fungus. The only remedies are flooding it out with water or sewage, or the lifting of the trees, the washing of the roots, and sprinkling them when wet with hot lime, the removal and burning of the whole of the border, and re-planting in fresh compost free from the fungus pest.

Root Gout prevails in certain districts. Instead of the roots being smooth on the surface, they are encircled at irregular intervals with a series of swollen protuberances, or rings, that seriously impede their functions. Such roots are specially brittle and fruitful of suckers; each swollen wart-like protuberance arrests the sap, and is prone to send its force up into suckers. Unsuitable soil, rank manures, careless digging among the roots, and sub-cropping Peach borders, are amongst the chief producing causes of this gouty state of the roots. When badly affected, however, cure is slow and uncertain, and the best plan is to destroy the trees, remove the old borders, and replace with new soil, re-plant, and steer clear of the chief producing causes of gout on the roots.

The Jaundice is the last disease to be noticed here. The leaves instead of being green have a yellow hue, hence the common name of "the yellows." An excess of cold, or of moisture, either in the earth or in the air, are the most common causes of the disease. Over-deep planting, unsuitable stock, and a sudden spell of excessively bright and hot weather after a season of cold, dull weather, may also result in jaundice. Violent attacks of red spider may have a similar effect. Surface or mound planting, careful culture, and protection are the best antidotes. And when these do not succeed it will be better to give up the culture of the Peach in the open air.

ROCK, ALPINE, FERN, AND WILD GARDENING.

ROOTERIES.

THESE, like not a few things useful, and even beautiful in their proper place, have been so much frowned down and sneered at, that it needs considerable courage to acknowledge their merits, and to suggest that it might occasionally be useful to set about their formation. For example, in a flat and hardly-rolling landscape on the chalk downs, treeless or grainless, where neither on nor under the surface a stone larger than a flint or pebble can be found throughout miles and miles, almost anything that breaks up the level tameness and dead monotony of the ground may be welcomed as a decided improvement. Not only so, but roots, irregular blocks of the upper ends of pollards, or the gnarled sides of decaying trunks, may be so disposed as to produce unique and highly picturesque effects. The pilers-up of Rooteries, like the builders of Rock-work, lost their way to picturesque results amid the heights and

distances of regular isolation. What, for example, could be less artistic, or less likely to commend Rooteries to those possessed of culture and taste, than four-and-twenty tree-stumps all in a row along the sides of a main walk, each stump as like as may be to another, and each nodding across the walk to its brother? Only the peculiarly grotesque character of some of those tops and bottoms protected them for some years from being swept off to the wood-shed. But had these so-called roots been grouped into masses, and employed to crown prominent knolls, or stand out boldly at the sides or summits of banks or dells, the effect would have been as picturesque and effective as it was tame and monotonous.

It is needful, however, to distinguish between Rooteries and what are called *wooden pots* in some parts of the country. These may be useful enough in their way, and are often made out of trees with regular boles and hollow centres. The trunks are sawn into regular lengths, set up on end, and filled with earth; and, if tastefully furnished with Ferns, climbers, or creepers, they often become useful, and even highly ornamental. Such pots, or wooden vases, are admirably adapted for growing such plants as Nasturtiums, Canary Creepers, Verbenas, Tea and other Roses.

Plants like Ivy-leaved Pelargoniums, Fuchsias, and many others, are very effective in such wooden pots, even when placed at regular or irregular distances on the sides of walks, or on the verdure of closely-shaven lawns. A large root, too, may often be used for the centre of a bed, the centre being filled with a bold mass of Yuccas, Pampas Grass, or having even the sides draped with Clematis, Ivy, or scrambling Roses; and the sight of such plants at unusual elevations, and so boldly contrasted with the leaves and flowers of other and many distinct plants at lower levels, gives novelty of form and colour, which seldom fails to please. In a similar way pollarded, gnarled, or knotted trees, and those already undergoing decomposition, can be utilised and transformed into things of rare beauty. With or without very slight manipulation, the heads and creviced sides of many old trees may be planted with striking plants, and others wound round, or made pendent from their rugged branches, and storm-rent or time-worn trunks.

These, and many other combinations, in which dilapidated trees may form the leading features, however beautiful, are outside the boundaries of the Rootery, and have little more relation to it than the prim sculptured or rustic vase has to the Rockery, on which—oh, horrible taste!—it is occasionally set. The true Rootery-maker scorns regularity. To set up roots in line is fatal to success in Rootery-making; neither can that be achieved on a level without an enormous waste of force that is material. Accident often reaches a perfection almost beyond reach of art. It was thus that several loads of roots piled formed an outline of surpassing quaintness and picturesqueness. The number of roots used was prodigious, and it took many loads of soil to fill up the huge interstices between them, thus hiding three-fourths of the roots. Planted chiefly with a collection of Ivies, Periwinkles, plain and variegated Clematis for colour, the white, many-scented one for odour and contrast with the others, the common and Veitch variety of Virginian Creeper for drapery, Furze, Yuccas, Pampas Grass, Arundo donax, Foxgloves, Common Berberries, and *B. Darwini*, Spiræa, &c., the effect after a few years was free, rich, and magnificent in the extreme. But this choice group, though a success, paved the way for rendering future efforts much more easy and successful.

Conditions of Good Effect.—This is to be found less in the roots than in the site. This should either be uneven at starting, or be made so before any roots are set. It is astonishing how tamely many landscape gardeners accept the natural form and contour of the ground. Of course, in many cases this cannot be bettered, and in all such it would be folly to change it. But in not a few instances a little labour and a slight expense on the ground or base-line pays better than the cost of piling together material, or planting it with the most suitable and valuable collection of plants. Each spadeful of earth moved, in point of rugged results, or picturesque effect, also does double duty. Each foot lowered, may be so ordered as to add one, it may be two feet to the height.

So soon as the germ of future result is partially developed, some of the larger roots and blocks should be placed in position. This enables the earth to be placed around them to varying heights, the result in this way being as if the roots, tops, or blocks cropped out naturally. Proper soil for the growth of suitable climbers and other plants can also be placed contiguous to the roots as the work proceeds. Heavy, massive blocks are thus also placed without smashing down banks or mounds, so that labour is economised, and the work infinitely better done, alike for artistic effect and cultural purposes. The lighter and more picturesque roots can be reserved for posting on coigns of vantage as the work approaches completion. If judiciously massed and grouped, the result when finished will be as natural and appropriate as if each mass or group had grown and decayed just where it was found.

Variety.—Covering the ground too thickly, notwithstanding the erratically varying base, results in a certain degree of uniformity, which is wholly to

be shunned. By leaving the lowest depths of the Rootery unclothed with roots, greater height is given to its raised portions. It is also needful to have clear places, and be able to see the roots properly, with their furnishing verdure and beauty.

Notwithstanding individual diversities of roots, it is astonishing how prone groups of them, or numbers disposed in isolated units, are to become mere similitudes of others. They need more skill than stones do to mould them into diversity in the grouping or setting. Irregularity of numbers, size, and distances apart will do much to give freshness and variety to the different groups and blocks; the sites of the groups and position will do more. The best of all means of avoiding uniformity consists in changing the position of the root-tops and blocks. The greatest cause of monotony in Rooteries, is the almost universal practice of setting each piece up on end, vertical with the earth, with the most ponderous part undermost. This is in most cases the rule throughout the Rootery, and that for several reasons —to make the roots solid, afford easy facilities for planting, and insure the plants deriving full benefit from the rain. But the roots would gain in variety and in picturesque beauty were they to lean in many ways out of the perpendicular. By the system of building them into the earth they would stand safely enough in such forms, and the planting could be so managed that the rains could find their way to the roots.

Free Outlets to Roots and Blocks.—Not a few failures have arisen from the placing of plants and soil in impervious blocks. In all cases where there is the slightest doubt about a free outflow from the roots, one or more slits should be made, or large augur-holes bored through them, to insure the free and prompt discharge of water. Unless the base of each plant-receptacle is specially rough and uneven, or consists of a considerable deposit of partially decomposed *débris*, some hard material should be inserted as drainage, and to keep the outlet free before the placing of the soil in the blocks.

Sufficiency of Soil.—It is unwise in such matters to trust much to the feeding properties of the roots themselves. Timber, whether solid or rotten, constitutes indifferent plant-food. The roots are chiefly ornamental appendages, and in a very secondary sense food-stores. Hence the importance of filling up the interstices between them, and also filling their vacuums with good soil. There is nothing better for most of the subjects so likely to be grown in the Rootery than a mixture of two parts of sweet, light, turfy loam, and one of leaf-mould or fibrous peat. This compost, with the *débris* that is likely to be added from decomposing wood, and the additional matters acquired from the stems and leaves of plants and trees, form a sound, durable, and excellent pabulum for most plants. If proper care was taken to dig, trench, clean, and enrich the soil between the roots, as these were grouped or set in position, the majority of the stronger and more permanent climbers, and many other plants, may be placed in the earth. This sets the blocks and roots free for other forms of vegetation. The blocks can thus be furnished with any compost that may seem most desirable; and such plants as hardy Daphnes, Heaths, Azaleas, Kalmias, Rhododendrons, or other peat-loving subjects, grown in the roots. The rare facility for isolating each block, and furnishing it with special soils, reserved for special plants, is one of the substantial advantages of this simple method of culture.

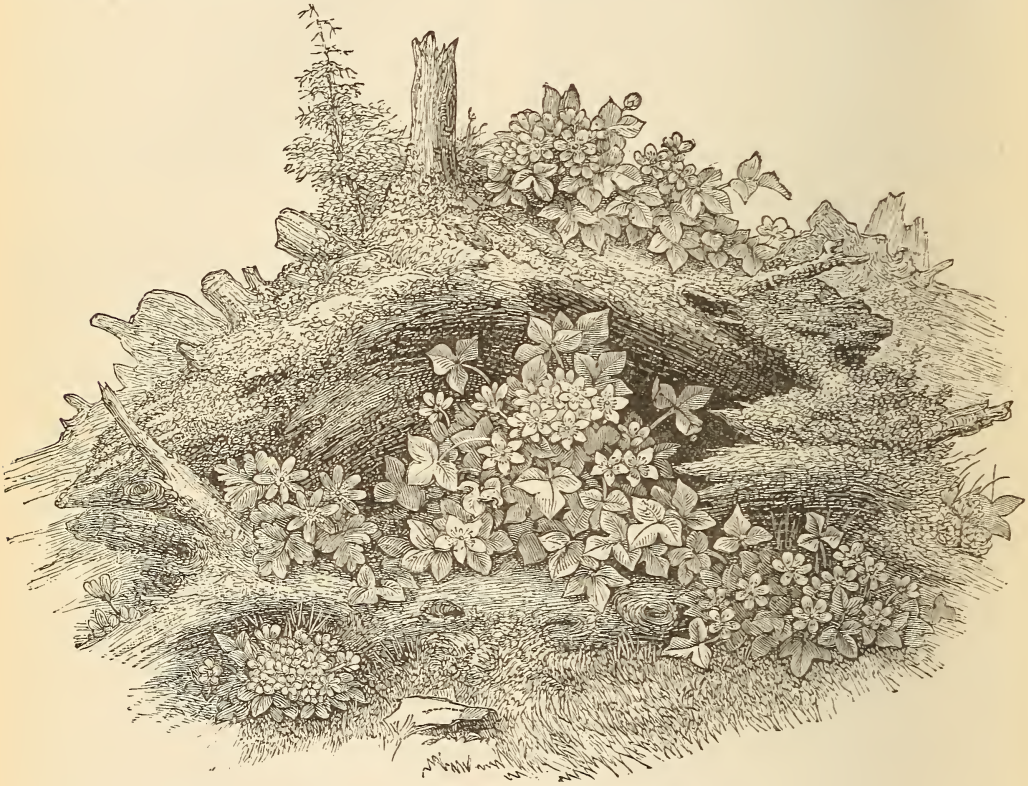
Best Sorts of Materials.—Medium sizes on the whole are best, though a few monsters are valuable as starers, and small blocks, especially if very irregular, are always valuable for filling up, and the enrichment of telling parts. Again, though the roots of trees have given their name to this style of decoration, the tops of pollards often furnish the best and the bulkiest of the material employed. The weird, gnarled, curiously-knotted trunks between the two also form charming material when time and decay have eaten out their hearts. All the Fir tribe may be dismissed as unsuitable. The resin and turpentine in these render them ungenial and unsuitable for the growth of most plants. Beyond these there need be no exceptions, though, possibly, the best of all trees for forming Rooteries are Sycamores, Maples, Planes, Limes, Elms, Oak, Ash, in the order of merit as here placed. Pollarded trees of course provide the best material, and, fortunately, those most suitable for the Rootery are of little or no use for anything else. Those too far gone, or too difficult to manipulate for firewood, are exactly those that have been mellowed into the greatest fitness for the furnishing of Rooteries.

Site of the Rootery.—All that has been said about the site of the Rockery (see Vol. II.) is equally apropos to the Rootery. They should never, however, be mixed nor contiguous, so as to be within sight of one another. In large gardens there is room enough, and to spare, for both; in smaller ones either alone would suffice. Where expense is little or no object, and especially where stones abound, and other physical characteristics of the country reveal its stony base, then a Rockery should be made. In level countries, such as the groups that go under the general title of East Anglia, where

almost the only ripples on the Dead Sea-like level are pollards, a Rootery is the most easily available, and perhaps, on the whole, the more appropriate. Grotesque pollards abound, and are, in fact, in not a few districts the most quaint features of the landscape. Hence nothing could be more natural than their accentuation into groups, and moulding them by the eye and the hand of taste into features of pleasing art in the garden or the landscape.

everywhere of one character and width, with here a group of plants encroaching, and there the walk widening out around some special object of interest and beauty—such should be the ever-varying character of Rootery walks.

Furnishing.—After all, this is the crucial point. As well go into the timber-yard in search of the picturesque as pile up masses of roots in pleasure-



Portion of Rootery with Wood Anemones.

Walks.—As the Rootery is made to be seen, walks should lead to every feature of interest and beauty. As to the width of the walks, they should be narrow—from a foot to a yard are convenient, and look well. When gradients are steep, easy steps, a foot wide, and six inches in the rise, are far preferable to steep slopes; and as for materials, wood may, of course, be used, and if with the bark on, and as near as nature left it, so much the better. No very fine finish need be put on Rootery walks. They have been seen even edged with stones and tiles; this is a huge mistake. Stones and gravel sufficient to keep them clean and fairly smooth, but not always nor

grounds or nooks of lawns, and leave them almost bald and bare in their uncouth deformity. The Rootery is, indeed, an anachronism unless it is skilfully planted and fairly clothed.

Rooteries demand three kinds of furniture:—creepers, to half conceal, while yet revealing, the most telling points of the blocks; plants to furnish the surface of the same; and yet others to clothe the interstices between them. For the first, climbers or creepers; for the second, telling dwarf trees, shrubs, herbaceous plants, Ferns, or bulbs; for the third, in small Rooteries, dwarf plants, such as Snowdrops, Wind-flowers, Winter Aconite, Woodroof or Forget-

me-nots, &c., and in larger ones, plants of much larger stature.

Climbers.—There is nothing like Ivy to begin with. Unfortunately, it is a dreadful monopolist. Give it a start of an inch, and it will take a yard—nay, a whole Rootery if left to itself. This is especially true of the larger-leaved Irish Ivy. The writer has known many Rooteries completely ruined by it, that is, if informally varied masses of superb grandeur can be called ruin. All other plants, however, have succumbed to the Ivy. The English, or common Wood Ivy, is far less grasping, and by choosing some of the many distinct variegated and other less robust Ivies, training them round the blocks at starting, leaving them tolerably free, yet curtailing excessive and monopolising extension, the Ivy will perform double functions of the highest importance. Such Ivies as the following are admirable for these purposes:—

Algierense variegata.	Maculata.
Aurea elegantissima.	Maculata latifolia.
Elegantissima.	Rhomboides variegata.
Elegantissima marginata.	Silver-edged.
Gold-clouded.	Spectabilis aurea, &c.

Clematis ranks next to Ivy for block-wreathing and clothing, and *C. Vitalba*, or our Wild Traveller's Joy, is among the most useful and telling of all the Virgin's Bowers for the clothing of the roots in Rooteries. It is, however, even a more dangerous monopolist than the Ivy, and after giving a few turns round a huge root, its head should be tied up into a neighbouring tree, where it may take a run of thirty or fifty feet. Other varieties of Clematis are described under Trees and Shrubs, and for a list of climbers generally we may refer to the hardy section of Climbers and Creepers. Here we can

Portion of Rootery with Snowdrops.

only briefly refer to the Honeysuckles, Jasmines, Virginian Creeper, several varieties of the Grapevine, Sweet-briars and Climbing Roses, and even Brambles, though these last, like Ivy, are apt to become dangerous encroachers if not kept within bounds. The article just referred to will supply all needful details under this head, and offer abundant material for choice.

Plants for Growing in or on Roots.—Although it is not needful, nor yet desirable, to convert all Rooteries into Ferneries, so far as the furnishing of the tops and sides of the roots is concerned, yet it must be admitted that few plants thrive better in or on blocks than Ferns.

Many of the hardy Ferns specified in our lists will answer for the furnishing of blocks; the Polystichums, Hart's-tongues, and Lady and Royal Ferns being among the most striking and suitable. While as for clothing the sides of blocks, and sending forth its charming tufts of verdure and gold from every nook, cranny, or crevice of stump or root, there is no plant to equal the Golden Polypody.

In striking contrast to these are the hardy Adam's Needles, or Yuccas, which have a charming effect raised on blocks, so as to exhibit all their beauties of form. Such families as the Acanthus, Arundos, Crambes, Fumarias, Panicums, Bamboos, Tritomas, crown and enrich the blocks with a classical style of beauty.

Quite another and equally effective style is produced by a rather free use of variegated and verdant coniferous plants in blocks, such as the different species of Cupressus, Retinospora, Arborvitæ, and Golden and Silver Yews.

The Japanese and other Maples, and such shrubs or herbaceous plants as the different species and varieties of Spiræa, Daphne, Deutzia, Euonymus, Forsythia, Genista, Hibiscus, Hydrangea, Hypericum, Ribes, Sumach, Tamarix, Wiegelia, Berberry, &c., produce admirable effects in blocks. Ericas, Azaleas, Andromedas, Crytomerias (especially *elegans* in a small state), Parnettyas, Laurustinus, Kalmias, Vincias, and the smaller-leaved Rhododendrons, such as Myrtifolia and Daphnoides, *Skimmia Japonica*, &c., are also good plants for these purposes. True, some of these, such as the Ericas, Kalmias, &c., are heath plants. But what is more simple and easy than the filling of a block here and there with peat, another with loam, &c., just where wanted, and then and there making each to a very considerable extent the centre of a new form of life and beauty?

Descending from shrubs to herbaceous plants, the following genera and species look well on or depending from roots:—

Acanthus latifolius.
Achillea asplenifolia.
Alstomeria aurea.
Anemone angulosa.
Anemone cærulea.
Anemone palmata.
Anemone sylvestris.
Aquilegia glandulosa.
Arum Italicum.
Asphodelus ramosus.
Astragalus monspessulanus.
Calystegia pubescens.
Campanula turbinata, and many others.
Delphinum in variety.
Dicentra (Dyletra) spectabilis.
Dictamnus fraxinella.
Epilobium angustifolium.
Epimedium pinnatum.
Ferula glauca.
Funkia Sieboldi.
Geranium sanguineum, and others.
Gypsophila paniculata.
Helleborus niger, and its varieties, and also other species.
Hemerocallis grammea and others.
Iris flavescens, Germanica variegata, and others.
Lychnis Chalcedonica, and others.
Menyanthus trifoliata.
Myosotis dissitiflora, and others.
Œnothera speciosa, reparia, macrocarpa, and others.
Phytolaca decandra.
Polygonum cuspidata.
Rudbekia laciuata.
Salvia argentea.
Sedum Sieboldi, spectabile, and others.
Tropæolum speciosum, and others.
Veronica corymbosa.

These are but mere samples of the many herbaceous plants suited for the furnishing of blocks. It is by no means, however, to be taken for granted that one plant of each of these families is to be placed in a block in the centre of it or otherwise to look exactly like the same plant placed in a border. But rather that each root, large or small, is to have character and distinctness imparted to it, by being wholly furnished with an irregular group of such plants.

Strong objection has been taken to the growth of Alpine plants in blocks. Some affirm that the decomposition of the wood is inconsistent with that solidity and sweetness of base that are indispensable to the successful culture of the more rare Alpine plants. There may be some force in the objection, which, however, can be obviated by placing stones in the roots, quite hidden from the eye, and planting the more choice Alpine plants in the chinks of these, or the crevices between two or more stones. By this simple expedient most of the choice Alpines already specified in our chapters on "Alpineries" would grow freely in or on the roots. A great many of the most common and useful dwarf plants as root-clothers have also been omitted, such as Aubrietias, Arabis, Alyssum, Arenaria, Cherianthes, Dianthes, Helianthemum, Linum, Silene, Saponaria, Saxifrage, Sedum, and Sempervivum.

The following are pendent plants, for planting in holes or crevices at considerable elevations from the ground, or depending from the tops of the blocks:—

Alyssum saxatile.
Antirrhinum rupestre.
Arabis procureum.
Aubrietias—all.
Calystegia pubescens.
Campanula garganica.
Campanula rotundifolia alba.
Cerastiums.
Convolvulus arvensis.
Dianthus deltoides.
Epigœa repens.
Fragaria media.
Galium vernum.
Genista prostrata.
Helianthemums.
Linaria alpina.
Linaria cymbalaria.
Linum decumbens.
Linum flavum.
Lotus corniculatus.
Lysimachia nemorum.
Lysimachia nummularia.
Malva campanulata.
Phlox reptans.
Plumbago larpentæ.
Potentilla alpestris.

Saxifraga argentea.
Saxifraga hypnoides.
Saxifraga sarmentosa.
Sedum Sieboldi.
Sedum spurium, &c.
Trifolium pentaphyllum.
Trifolium repens.
Veronica prostrata.
Zauschneria Californica.
&c. &c.

The Rootery may also be planted with bulbs, and few plants gain more by being lifted near to the eye. It gives quite a new character to not a few of them, and a Rootery mainly furnished with such bulbs as Snowdrops, Crocuses, Gladiolus, Hyacinths, Bulbous Irises, Lilies, Narcissus, Orchis, Scillas, Tigridias, and Tulips, has quite a rich and glowing character.

Ornamental grasses are also suitable. A few blocks furnished with *Briza maxima* first suggested this idea. The plants filled the entire crown of the blocks, and drooped gracefully over the side, and this and *Briza gracilis* were repeated to such good purpose until the following, among others, were added:—

Agrostis nebulosa.
Agrostis pulchella.
Anthoxanthum gracile.
Bromus brizæformis.
Bromus elegans.
Eragrostis elegans.
Erianthus Ravennæ.
Erianthus stricta.
Elymus caput Medusæ.
Panicum maxima.
Panicum sulcatum.
Stipa elegantissima.
Stipa pinnata.

Furnishing of the Ground-lines.—There are two points to be aimed at in this matter: the chief is the carpeting of the interstices between the blocks with dwarf vegetation; the other, the adding to the effects of the blocks themselves by the employment of tall, striking, and, as far as may be, different vegetation from that used either in or around the roots. Taking the latter first on a larger scale: some of the smaller and more ornamental trees, such as the cut-leaved Birch and Beech, the variegated and other Maples, Laburnums, Almonds, Acacias, Weeping-willows, &c., prove very effective. Among shrubs the taller Spiræas, Deutzias, Syringas, Sumachs, Brooms, Tamarisks, Berberis, choice Hollies, the purple-leaved Filbert, and similar kinds, are striking. A few choice green variegated Coniferæ are also admirable, provided these have not been used on the larger blocks. In regard to the use of trees, however, or large shrubs, it must be understood they are to be kept small, or removed when they become too large, as otherwise they will grow up to the utter ruin of the Rootery. But the chief reliance must be on tall and striking herbaceous plants, such as the Heracleum, Foxglove, Fennel, Globe Artichokes, Scotch and other Thistles, Single Sunflowers, tall or Ox-eyed Daisies, Monkshoods, Michaelmas Daisies, Golden Rods, tall reedy Arundo donax, Verbascum, the New Zealand Flax, plain and variegated; Rhubarb, and, in a word, almost any plant with striking leaves or flowers, too coarse or too tall for the herbaceous bed or border, would prove useful, and chiefly for those very qualities, among the roots.

Of course these strong-growing subjects would be planted chiefly among the blocks, and their tops would be disposed of so as to lighten, not hide, the effect of the latter.

Dwarf Clothing of Interstices in the Rootery.—As already remarked, the more you dwarf the plants on the base-line, the greater the apparent height of the blocks, and as they are set to give height, it is obvious that the lower in reason the plants used the better. Hence the importance of a free use of Forget-me-nots, Daisies, Hepaticas, Valley Lilies, Primroses, Violets, Alpine Auriculas, Oxalis, Aubrietias, Iberises, Alyssums, Wind-flowers, Wood Hyacinths, Woodroof, and dwarf Phloxes, Pansies, Irises, and bulbs, &c., for base-lines. There is hardly any limit to the plants available for this purpose. The following list of suitable plants, in addition to the above, will be found useful:—

Ajuga reptans variegata.
Antennaria alpina.
Antennaria tomentosum.
Arenaria Balearica.
Arenaria montana.
Arenaria verna.
Campanula fragilis.
Campanula hederacea, &c.
Cerastium Biebersteinii.
Cerastium tomentosum.
Convolvulus Mauritanica.
Ivy (creeping, common, and variegated).
Lamium of sorts.
Linaria cymbalaria.
Lithospermum prostratum.
Lysimachia nummularia.
Malva campanulata.
Phlox reptans.
Phlox subulata.
Potentilla gracilis.
Potentilla reptans.
Santolina alpina.
Saxifraga (any of the dwarf species).
Sedum (any of the dwarf species).
Seline maritima.
Sempervivum (any of the dwarf species).
Thyme, Golden, Silver, Lemon, and common.
Veronica alpina.
Veronica chamædrys.
Veronica repens.
Vicia argentea.
Vincia (in dwarf varieties).

The whole of the plants recommended for Rooteries are equally suitable for Rockeries, and the general principles of planting and furnishing are the same in both cases, only the clothing of rocks should not be carried quite so far as that of roots in general, and a considerable portion of the latter should be fully exposed, the rocks probably adding more than the roots to the effects of the flowers by their contrast and intrinsic beauty.

The general culture of the Rootery is practically identical with that of the Rockery, though demanding perhaps rather more constant care.

Slugs and other Pests.—Slugs are the greatest foes of Rooteries and Rockeries. They find excellent breeding, hunting, and feeding grounds around the many nooks, corners, and *débris* of such places, and the more choice the specimens the more certain they are to prey upon them. Frequent night-hunts, traps of Cabbage-leaves, bran, and cold Potatoes, picklings of lime and soot, dry and hot, are among the best slug-

destroyers. Occasionally, too, beetles, ants, and other pests are troublesome, and they must be destroyed by boiling water or other methods.

But the worst pests of all remain to be noticed. These are mice, rats, hares, and rabbits. The former prey chiefly on bulbs, the latter on almost every green thing; and where they abound all valuable plants must be placed high upon the blocks, beyond their reach, or otherwise they speedily make a clean sweep of all the more choice plants.

Watering.—This needs much attention in dry weather. The higher and more fully exposed, the sooner the plants scorch up, and this is apt to be the fate of a great many of the best rooters unless they are carefully attended and watered when necessary, which may be daily in the case of many plants during severe drought. The differences between a Rootery carefully watered and one left to nature only, must be seen to be appreciated.

Nothing benefits the Rootery more than an annual overhaul, and a top dressing or two a year if time can be found for it—that is, in the late autumn, and again, say, in March. Fresh-surface all the delicate patches, pressing the soil very firmly round the roots, and dividing the plants when needful at the same time, keeping a sharp outlook for weeds and insects.

As the plants get overcrowded into weakness, or seem to get exhausted, there is no means of resuscitating their vigour, and renewing their youth, equal to planting on fresh sites, or in new soil on the old ones.

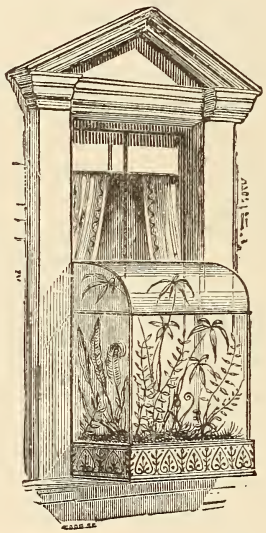


Fig. 25.—Conservatory Window.

An arrangement of this kind, known as a conservatory window, is shown in Fig. 25. Cases of this description can project much further out from the window, affording space for building miniature rocks for trailing plants.

Conservatory window-cases are not often made higher than about the half of the window, though they could be made much taller if it were wished to grow climbing plants. Windows, however, are of as much importance for ventilating and airing a room as for lighting it; and a case which covered the whole of the window would need special arrangements at the top of it to meet the ventilating requirements referred to.

As to the plants which would be grown in conservatory windows, everything depends upon the control which may be available for checking extremes of heat in summer, and cold in winter. Perhaps the best protection for both of these extremes is an external Venetian blind, kept from touching the glass by three vertical wires. The ends of this miniature conservatory should be made with double panes of glass about an inch apart. The space of air between the two panes is sufficient to prevent any sudden change of temperature, provided that the Venetian blind is drawn down in good time. In summer the blind would only be down for two or three hours in the middle of the day, when sufficient light would enter at the ends; and in winter the blind might be kept down for a fortnight, the ends supplying sufficient light for that season. In very severe weather it might be desirable to burn a large candle, or a small spirit-lamp, inside, which would be sufficient to keep out frost.

Plants in flower want more air than foliage plants; hence it is not advisable to grow flowering plants in structures of this kind. If, however, Ferns and suitable foliage plants are grown, and space is left to furnish temporarily with plants (in pots) in flower, very pretty effects can be obtained all the year round.

Window-sills.—Window gardening is by most persons supposed to be limited to the decoration of window-sills with plants; but from our previous remarks on the subject it will be seen to have a much wider application. As, however, it is usually the starting-point of all house gardeners, it requires

HOUSE, AREA, AND WINDOW GARDENING.

By William Thomson.

OUT-DOOR WINDOW GARDENING.

WE have hitherto dealt only with plants in rooms. We now come to the subject of plants on the other side of the window-pane.

If it is only intended to grow a few plants, it is undoubtedly best to have them in an external glazed case, so arranged that upon throwing up the lower half of the window-sash access to all the plants can readily be obtained.

at our hands more consideration than some other subdivisions of domestic horticulture.

The simplest form of window-sill gardening is the growth in pots of three or four Geraniums, or Fuchsias, by watering them when the earth is dry, and taking them indoors in frosty weather. The next step is to try and lessen the work of watering by protecting the sides of the pots, and thus preventing so much escape of moisture by evaporation. The readiest way of doing this is to put each pot into another pot two sizes larger, and to fill up the space between the two pots with moss. By this arrangement much labour in watering will be saved, and the roots of the plant will be kept in a more natural condition.

Of course a still better plan is to fasten three sides of a box round the whole of the window-sill, and then to pack moss around all the pots. This woodwork can be secured with small brackets, either to the brickwork of the house, or to the woodwork of the window-frame, as may be most convenient. The outside may be ornamented with tiles, or cork, tacked on.

The next best arrangement to this is to have a box to fit the window-sill, and filled with moss, into which the pot-plants can be plunged; or filled with earth in which the plants can be placed, and the pots thus dispensed with. This box may be made of wood, slate, or pottery. If wood is used, it should be well painted, or tarred, inside, otherwise it will soon rot and fall to pieces. The ornamentation of the outside can be done, as cooks say in the matter of salt, sugar, and other addenda, "to taste."

Window Boxes.—The construction of boxes to stand on window-sills is a very simple affair to any one who possesses a slight knowledge of tools and their use. But as some of our readers may not have "graduated" in a carpenter's shop, a few hints and drawings may be found useful. The easiest form of box to make is that shown in Fig. 26, where the bottom is simply nailed in between the sides. If it is thought that the weight of the pots might burst out the bottom, it can be strengthened by strips of hoop-iron passing under the bottom and up the sides for two or three inches. These strips, after being cut of the proper length, must have a couple of holes punched in each end, so as to permit of their being nailed to the side of the box. The best wood to use for boxes is yellow deal; boxes made of this, if painted with four coats of oil-paint, will last for years.

As window-sills are not flat, but all slope a little downwards from the window to throw off rain, one or more wedges must be put under the outer edge of the box to keep it level. One of these wedges is shown at c in Fig. 26. When these have been prepared of the proper size and shape, they should be nailed on to the bottom of the box; otherwise, they are liable to slip out of their places. But a more workmanlike method is to make the outer side of the box a little deeper than the inner one, and then no wedges will be required. To do this, a section of the proposed box must be drawn, somewhat as in Fig. 26, where D represents a section of the window-sill. In order to ascertain the exact incline of the sill for which the box is to be made, one leg of a partly-opened two-foot rule must be laid on the sill, and the other leg moved up against the wall of the house; if

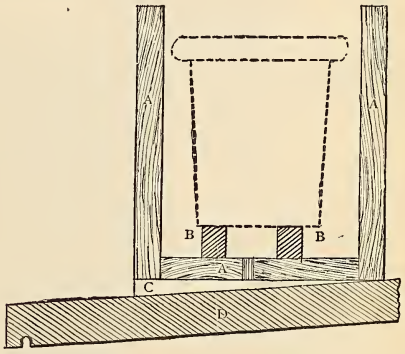


Fig. 26.—Window Box.

the rule in this position be laid down on the paper, a line drawn along the outer edges will show the required slope.

Drainage must, of course, be provided for by making a few holes in the bottom of the box with an auger, or centre-bit. If, however, a portion of a flower-pot stood upon one of these holes, it would stop it up. It is therefore necessary that the pots should be kept away from the bottom of the box, either by a layer of gravel not small enough to fall through the holes, or by strips of wood fastened to the bottom, as shown at B B, Fig. 26. If wood is used, then the strips must be well painted before they are put in, otherwise they will soon rot.

A better mode of making the lower part of the box, is by cutting shallow grooves in the sides into which the bottom fits, and in which it is then secured by screws from the outside. After this has been cut and fitted together, it must be taken to pieces and thoroughly painted several times before it is finally screwed up.

Perforated zinc trays are preferable to either of those methods.

Take a perforated sheet of zinc of the same size as the bottom of the box; turn up the edge for half an inch all round so as to form a shallow tray, turn this

tray upside down, and drop it into the box so that it may stand on its edges. This is the best method of keeping the pots off the bottom of the box, and it is very easily removed for cleaning out the box if any earth, or leaves, should have fallen over.

Fig. 27.—Frame for Tiles.

The decoration of the outside of the box can be effected in many ways. Very pleasing ornamentation can be made out of branches of hazel cut into lengths suitable for the work, and sawn down the middle; the flat side is then tacked to the sides of the box in patterns. When curved branches can be found, a pattern can easily be produced; but as it is of rare occurrence to meet with two pieces of wood naturally curved in the same way, it is better to make curves out of straight pieces.

The curving of sticks is by no means difficult. The wood must be cut during the month of December, January, or February. It must be kept in a cool dry place until the bark has lost its sappiness, and will not easily peel off; the wood is then in the best condition for bending. It should then be immersed in boiling water for about ten minutes, after which it must at once be bent into the required form, and secured with a twisted cord. If any particular curve is required, or many curves are wanted all alike, it is better to bend the sticks over a mould. When thoroughly cold and dry the cord may be removed, and the curve will be fixed.

It is a common practice now to decorate the outside of boxes with tiles. These may be had of several suitable sizes, and in endless variety of colour and design. They are so hard and brittle that it is difficult to drill holes in them without breaking them. It is, therefore, better to screw on above and below a grooved strip of wood, a section of which is given in Fig. 27, A A. Between these the tiles are slipped in. As to colour, blues, purples, greens, crimsons, scarlets, yellows, and whites should be avoided; selection should be made amongst browns, dull reds, and olives. Design on tiles is not of so much consequence; but simple geometrical designs are sure to be in good taste.

It may be desirable in some cases to allow the box to extend beyond the width of the window-sill. It will then be necessary to have the box made of stouter wood, and to dovetail it together. The bottom should be put on underneath, as indicated in Fig. 28, and screwed up with brass screws, which will not rust. In the same figure is shown the bearer A, which must fit the slope of the window-sill, and be fastened to the bottom of the box. This bearer, if properly made, will distribute the weight of the plants evenly over the sill; at the same time the box must be secured to the woodwork of the window so as to prevent its toppling over, though a very slight attachment will be sufficient to secure its safety, as the pressure is all vertical.

Fig. 29 will give some idea of how pretty windows can be made to look if plants are judiciously selected and properly grown. Straight lines are broken up, and groups of foliage and flowers are well balanced and symmetrically distributed, but without formality. Hanging plants and climbing plants are both employed effectively, and prevent that stiffness and primness which always arises from the use of erect-growing plants only. The rigidity of the stiff Cactus is toned down by the gracefully hanging branches of the Ivy-leaved Pelargonium, which droop below it. These effects may be varied in endless ways by the harmonies and contrasts which we are able to effect by the proper use of the materials available.

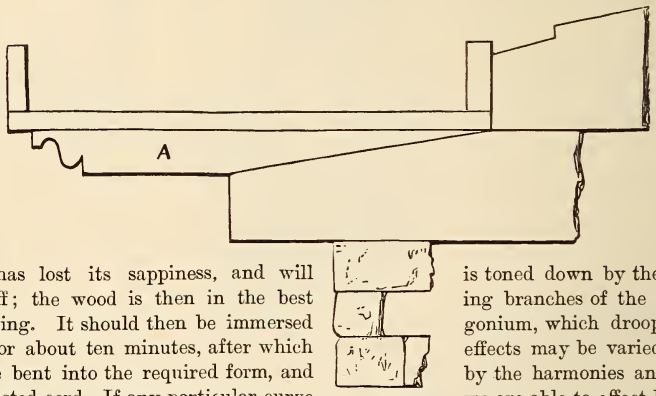


Fig. 28.—Wide Window Box.

Balcony Gardening.—The roots of plants on balconies are much more liable to injury from frosts than those growing in ten inches or a foot of soil, hence the need of protecting them with leaves, straw, cocoa-fibre, dry fern, or some such material.

Where large masses of soil are required for strong-growing plants, tubs, or square boxes, made of wood, are preferable to pots, partly because they are less liable to injury by frost or accident, and partly because they are more easily ornamented with smaller plants in hanging pots, for which a nail may be driven wherever wanted.

Balconies are naturally much exposed to wind and rain; hence hardy plants should be preferred to tender sorts.

In many houses it would be practicable to cover the balcony with a light roof of glass, and to hang up a curtain in front in very severe weather; this would convert the balcony into a green-house for the time being, particularly if the curtain were drawn somewhat tight, and were made of tiffany, or some other thin material.

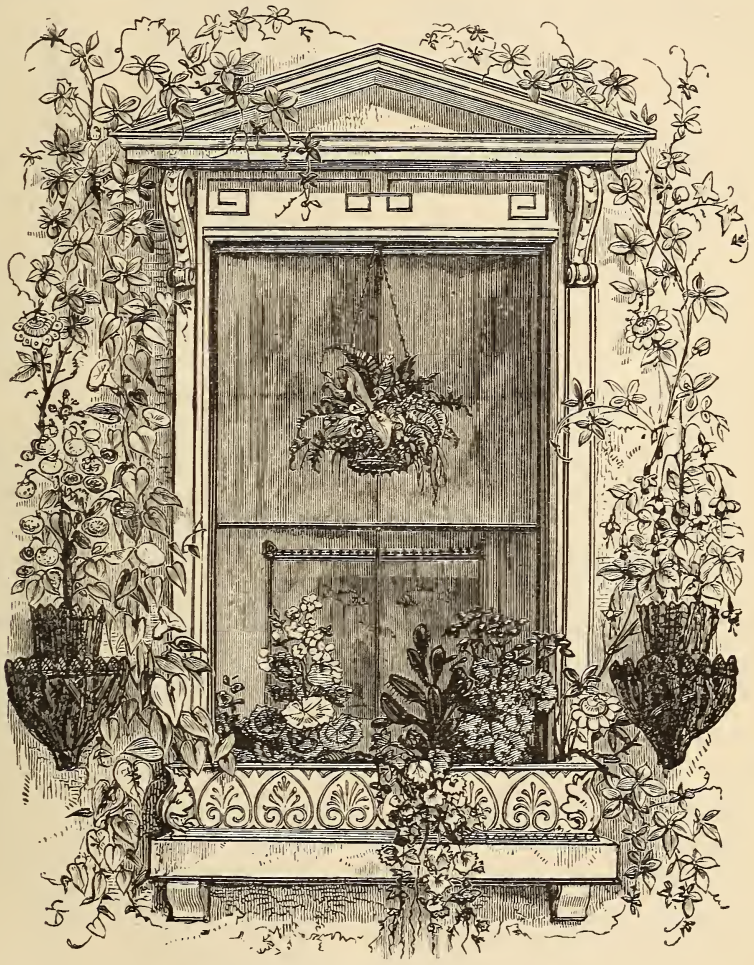


Fig. 29.—A Window Garden.

Strength of Balconies.—When engineers have to construct iron bridges for railways, it is their practice to design them of such strength that they will bear four times the greatest weight which is ever likely to be placed upon them. Similar care should be taken by architects in regard to balconies. As, however, many houses are run up by speculative builders without architectural supervision, it is prudent to satisfy oneself that the balcony will not come down under the load which it is proposed to make it carry. In order to obtain useful information on this point from a competent person, one must be prepared with a reply to this natural inquiry—"What weight do you propose to put on that balcony?"

Before answering this question it is necessary to know something about the weight of plants, the principal portion of the load to be carried.

Weight of Plants in Pots.—Let us suppose that that portion of a balcony which is to be covered

with pots is ten feet long, and one foot wide. Upon this space it is evident that you can arrange

10 pots, each 12 inches diameter (outside).
40 „ „ 6 „ „ „
90 „ „ 4 „ „ „
160 „ „ 3 „ „ „

The following table gives, approximately, the weights of pots of various sizes, and of the crocks and soil in them:—

Outside Diameter, in inches.	Weights.		
	Empty Pot.	Contents.	Total.
	lb. oz.	lb. oz.	lb. oz.
Three	4	9	13
Four	10	1 1	1 11
Six	1 9	3 3	4 12
Eight	3 11	5 1	8 12
Nine	5 4	10 0	15 4
Twelve	11 0	25 8	36 8

Reverting now to the supposed space of ten feet by one foot, it will be seen that the total weight of the

160 pots of 3 in. diam. will be 130 lbs 0 oz.
90 „ „ 4 „ „ „ „ 151 „ 14 „
40 „ „ 6 „ „ „ „ 190 „ 0 „
10 „ „ 12 „ „ „ „ 365 „ 0 „

Hence it is manifestly better to use small pots in preference to large ones if the plants will grow equally well in both; since the smaller pots proportionately cost less, hold less, and weigh less, being thus in all respects more economical. Nevertheless plants in small pots undoubtedly require more care and attention than those in larger pots.

Shrubs for Balconies.—Many of the dwarfer kinds of shrubs which will be recommended for planting in areas can be grown on balconies, provided that sufficient room can be found for them. In order to force plants into bloom, we curtail their root-room by growing them in the smallest pots possible. So also, if we desire to encourage the production of foliage, we allow plenty of room for the roots to ramble in a natural way, and we give water frequently.

The selection, therefore, of shrubs, and other plants for balconies, greatly depends upon the accommodation which can be afforded for tubs, boxes, and large pots; and this, of course, must be limited by the strength of the balcony to bear such weights. If a balcony should be pronounced unsafe, it can readily be made available for almost any weight by means of light iron pillars from the ground, or from the area below. Climbers can be trained up these pillars, and thus convert what might have been an eyesore into a real ornament to the house.

Hardy Shrubs.

Berberis Darwinii, and B. Stenophylla—very pretty evergreen shrubs. The latter flowers in March, and the former in June; the apricot-coloured blossoms are freely produced, and are always admired.

Buxus sempervirens (common Box)—several varieties, all evergreen.

Colchican Laurel.

Common Laurel.

Cratægus pyracantha, although usually seen trained up the walls of houses, may be grown as a bush if the longest shoots are cut back. It produces abundance of pinkish-white flowers in May, followed by orange-scarlet berries, which hang all through the winter.

Ligustrum Japonicum—broader leaves than the common Privet, and a brighter green colour; it produces large panicles of sweet-scented white flowers in June.

Mottled and the green Aucuba.

Pernettya mucronata—this evergreen requires peat, and grows about three feet high if planted in good peat. Leaves dark green, flowers small and whitish; its scarlet berries, which remain upon the plant throughout the winter, are its chief ornament.

Phillyrea latifolia—for pot-culture in any soil.

Santolina Chamæ-Cyparissus (Cotton Lavender, or Winter Lavender) grows about two feet high, and has a profusion of little, hoary, grey-green leaves, which cover its branches. The plant emits a pleasing fragrance if the hand is passed gently over it. It produces yellow Daisy-like flowers in the summer.

Veronica Andersoni—this is only one out of many very beautiful kinds of Veronica which may be used.

Tender Shrubs for Warm Balconies.

The following are very desirable shrubs for cultivation in tubs, or large pots, in balconies not exposed to draughts, or cold winds, and where some protection can be given in severe weather. We will take the evergreens first.

Buxus Balearica has leaves much larger than the common Box, being nearly two inches long, and of a bright, shining green.

Camellias may be grown out of doors in covered balconies with a north, or north-west, aspect. They will stand many degrees of frost if the soil at the roots is dry at the time, but the early morning sun must not be allowed to fall upon them after a frost. At all times they require very careful watering, being equally liable to injury from too little, or too much, water. The beauty of their flowers is well known, but even if they should not bloom, their evergreen foliage is very handsome.

Coprosma Baueriana—the variegated form of this dwarf New Zealand shrub is a very ornamental plant, the margins of its leaves being either white or yellow. It may be readily mistaken for a good variety of the Japan Euonymus.

Coronilla glauca—a very pretty evergreen, upon which little bunches of yellow Pea-like flowers may be found from early spring until late in autumn. Peat, mixed with a little sandy loam.

Desfontainea spinosa is a beautiful evergreen, from Chili and Peru, having a thick mass of Holly-like leaves, with rich scarlet, tubular flowers, nearly two inches long. It requires to be kept very dry at the roots during winter.

Erythrina crista-galli—though this is an evergreen in its native country, Brazil, it is usually cut down by frost out of doors in England. Nevertheless, if mulched at the roots through the winter, it will shoot up again in the spring, and produce large, scarlet, Pea-shaped flowers in great abundance. The intensely red colour of these blooms has caused it to be known as the Coral Plant.

Escallonia macrantha has bright, shining leaves, of a dark green colour, and flowers freely in August, producing quantities of little crimson bells. A mixture of loam, sand, and peat.

Euonymus Japonicus (the Japanese Spindle Tree) is a most useful evergreen, and is, perhaps, more commonly used as a pot plant than any other shrub. There are several varieties, the best of which are the broad-leaved sil-

ver-edged, and the golden-edged varieties with broad leaves and with narrow leaves. Any soil seems to suit them.

Euonymus radicans — this appears to be known only in its variegated forms, of which there are three or more. Its growth somewhat resembles that of Ivy, some of its branches throwing out side roots, which will cling to a wall. It clambers over rock-work, and looks well amongst dark evergreens, the white parts of the leaves being very distinct and clear.

Griselinia littoralis, and G. lucida, are two New Zealand shrubs, with bright, shining leaves, of unusually thick substance, and are well worthy of trial in balconies.

Habrothamnus elegans is a Mexican evergreen, which is in flower nearly all the year round, growing freely in loam, and producing a profusion of rosy-purple blossoms.

Laurustinus (Viburnum Tinus) is a very useful shrub, producing a profusion of trusses of creamy-white flowers at the ends of its branches in winter, beginning in December, and lasting for two or three months. There is also a pure white variety.

Myrtles—these are probably the best kind of shrubs that can be grown. When they can be induced to flower their white blossoms are always much admired, while their foliage is useful as a background to other plants in flower, or for the decoration of bouquets when the specimens are large enough to cut from. The leaves, when bruised, are very odoriferous. The plants thrive in sandy loam and peat.

Oleander—the best variety of this evergreen is Nerium splendens, which has bright pink flowers, which last in bloom for a long time. It requires a light, rich soil, and plenty of water.

Skimmia Japonica, and S. oblata—both Japan evergreens, with thick pale green leaves of pleasing brightness. In greenhouses the ends of the branches produce clusters of sweet-scented white flowers, which are followed by scarlet berries.

Sweet Bay (Laurus nobilis)—this is grown for its foliage only, as the flowers are not showy. Its leaves have an agreeable perfume when bruised. It will grow in any common garden earth.

Amongst deciduous tender shrubs, and half-hardy perennials for balconies, we must give the first place to

Aloysia citriodora—the Lemon-scented Verbena — is one of the neatest of flowering shrubs; its French-white blossoms are exceedingly light and pretty, while the delicious perfume given off by its leaves at the slightest bruise, or touch, is well known. There is an East Indian Grass, Cymbopogon Schœnanthus, which emits a very similar fragrance.

Fuchsias—these are too well known to need detailed descriptions. Although they will live and grow in almost any soil, peat, leaf-mould, and old manure in equal parts, to one of sandy loam, suits them best.

Pelargoniums, at least the hardier varieties, are very ornamental when trained up a wall, or tied to the railings of a balcony. They may be well grown in the same soil as that recommended for Fuchsias.

Climbers for Balconies.

Calystegia pubescens—this is a double-flowered, rose-coloured Convolvulus. As its lower leaves are liable to turn brown, and look rather untidy, it should be trained up behind some short bushy plants, which would thus conceal this defect. It does well in loamy soil, and blossoms in July and August.

Cobœa scandens—this free-growing green-house perennial may be used upon warm walls during the summer.

Eccremocarpus (Calampelis) scaber — a very elegant climber, with orange flowers, which looks well trained up a pillar, or allowed to ramble over netting on a warm south wall. A light, loamy soil suits it best. It can be grown from seed or cuttings.

Lathyrus—the Everlasting Pea (L. latifolius) has always been a great favourite; its spikes of crimson flowers are produced in quantities in August, and if the pure white variety of it can be obtained, there are few flowers to surpass it. The purplish-blue Lord Anson's Pea (L. Magellanicus) is another desirable kind of Everlasting Pea, which flowers in June. Both these species are perennial, and scentless. The best of the scentless annual species is the Tangier Pea (L. tingitanus), which produces large dark purple flowers in July.

Lophospermum scandens—a Mexican climber of elegant habit, having large, showy, rosy flowers. It does best when grown every year from seed in good light soil. It is an evergreen, and produces purplish-violet flowers in June.

Maurandya Barclayana—an elegant little twining plant, with blue and white flowers; it requires wires, or a trellis, to support it, and a light, rich sandy soil to grow in. Cuttings struck in a green-house, or warm window, may be put out of doors when there is no further risk from frost, and they will bloom from July to September. Plants may also be raised from seed.

Pharbitis hispida—this is better known under the name of Convolvulus major, of which the blue variety with a white tube is most commonly seen. The flowers appear in August. The seeds should be sown in a mixture of sandy loam and leaf-mould, and the pots kept in a warm place until the seeds begin to grow.

Sweet Pea (L. odoratus) — the most popular of all the annual climbers, may be had from white to crimson, scarlet, and purple, almost to black.

Tropæolum aduncum—the Yellow-flowered Canariensis, or Canary Creeper—is one of the best climbers for a balcony. It grows in any light rich soil. It is always admired, and looks well mixed with other Tropæolums.

Tropæolum majus — the common Nasturtium—requires to be trained, or tied, to a netting or other support. There are many varieties of it, the prevailing colours being bright scarlet, orange, and crimson. It will grow freely in any good light soil.

Tropæolum speciosum—this very elegant climber is difficult to grow in the South of England generally, even under the care of professional gardeners; yet in Scotland it is by no means uncommon, and we have seen it well grown by amateurs in North Wales and in Kent. It would be best to get an established plant of it in a pot, and to shift it into a large pot without disturbing or exposing its roots. Its long slender branches, covered with delicate foliage, will run along horizontal wires or strings for a long distance, and the last three feet of each shoot is crowded with little scarlet blossoms in June and July.

Hardy Annuals.—Where balcony horticulture must be limited to the use of flower-pots, there is no class of plants which will produce so much colour as hardy annuals. The usual month for sowing annuals is April, but if it be desired to have a certain kind of plant in bloom for a long time, this end may be often attained by sowing a batch of the seed every month from February to June; if the plants raised from the seed sown first are not injured by a late spring frost, flowers may be had early in May, and from thence up to late in the autumn.

When we say that an annual blooms during a certain period of the year, it must not be understood that one sowing will always insure this; it does so in some cases, but in many it is necessary to sow more than once.

There is an immense variety of plants which come under this heading, and it would be impossible to grow them all. A selection is therefore desirable, and unavoidable, and the following list will be found

to be sufficient for most balconies, and well varied in colours and in habit of growth.

Amberboa odorata—the yellow Sweet Sultan—grows about eighteen inches high, and has sweetly-scented lemon-coloured flowers in July and August.

Bartonia aurea—nearly two feet high, and has large, showy yellow flowers from June to October. It is particularly attractive to bees.

Calendula officinalis — the double Marigold — has showy orange flowers, about a foot high, from June until autumn.

Chrysanthemum carinatum —this is a very variable species, the flowers having combinations of crimson, yellow, white, and black in great variety; it grows from one to two and a half feet high, and blooms from June to September.

Clarkia pulchella is an elegant plant from eighteen inches to two feet high, having purple, magenta, rosy, or white flowers, from June to October.

Collinsia bicolor grows about one foot high, and is much branched, its flowers being lilac and white, and appearing from May until September.

Convolvulus tricolor — this is the minor Convolvulus of gardens; it grows a foot high, and has flowers of dark purple, violet, blue, lilac, and white, which last from June to October.

Coreopsis tinctoria has orange, or dark reddish-orange flowers, which last from July to September. It grows nearly three feet high, and can be kept continuously in blossom by removing the faded flower-heads.

Delphinium consolida—the Branching Larkspur—produces flowers of blue, pink or white, from June to September, and grows about a foot high.

Dianthus Chinensis—the so-called Indian Pinks are really Chinese Pinks, while some of the best varieties of them, Heddewigii and laciniatus, came to us from Japan. Their colours are very brilliant, being in shades of purple, carmine, crimson, and white, some being striped, some spotted, and they grow about ten inches high. They flower from June to September.

Erysimum Peroffskianum—grows nearly two feet high and has deep, rich, orange flowers from May to August.

Eschscholtzia Californica—it is a pity that people will murder the name of this beautiful plant by calling it Eskoltsha; the proper pronunciation is Esh-sholt-zia. Generally it is of a pure deep yellow, sometimes white, sometimes orange, and grows a foot high, flowering all through summer and autumn.

Gilia tricolor — a pretty, slender plant, growing a foot high, and flowering from July to September. It is usually purple and lilac, with black near the centre; but there are pink and white varieties.

Godetia Whitneyi bears a profusion of bright pink flowers, each petal having a large crimson spot on it. The blossoms are nearly four inches across, and yet the plants are not more than one foot in height. It remains in bloom from June to September.

Iberis umbellata—the common Candy-tuft—would be more correctly called Candia-tuft, from the island whence it came. It grows about a foot high, and blooms from May to August. It is generally purple, though often seen crimson, pink, and white.

Ionopsidium acaule—this diminutive but free-flowering plant may be had in blossom from April till October. It is lilac or violet and white, and not more than three inches high.

Linaria Cymbalaria is a delicate little trailing plant, which hangs prettily over the edges and down the sides of a hanging pot. Its flowers are pale lilac, and appear in May. It does best in brick rubbish, old mortar, or other poor soil.

Linum grandiflorum—most of the species of Flax have blue flowers, but the blossoms of this species are either crimson or scarlet, coming out in June, July, and August. The plants grow about a foot high.

Lupinus Cruickshanki — a single seed of this fine plant should be sown in the middle of a good-sized pot, as it will grow four feet high. Its Pea-like flowers are blue and yellow, changing to pink as they go off. It blossoms from June to September.

Malcolmia maritima — the Virginian Stock, has lilac, pink, or white flowers, and grows about a foot high, blossoming from June till August. The seed should be sown rather thickly, and the young plants, which are of slender habit, look best when supported by a few threads tied across the pot to short sticks placed near the rim, six or eight inches above the soil.

Mimulus cupreus is a very variable plant, its flowers being usually orange, though sometimes crimson, scarlet, yellow, or nearly white, and often beautifully spotted or blotched with a darker colour. It grows nine inches high, and is in flower from June to September; it likes a moist soil.

Nemophila insignis has large sky-blue flowers with a white centre, and grows about nine inches high, flowering from June until the autumn.

Reseda odorata—Mignonette—is grown only for its perfume, since there is nothing in the form or colour of its flowers to recommend it. It is usually in bloom from July to September, growing about a foot high. There are several varieties, some more sweetly scented and highly coloured than others.

Saponaria Calabrica — this may be had in flower from early spring to late autumn. It is a compact plant, producing a profusion of little bright pink blossoms, and growing about a foot in height.

Whitlavia grandiflora grows two feet, and bears fine bell-shaped flowers either blue, or white, or blue and white. It is in flower from June till October.

HOT-HOUSE OR STOVE PLANTS.

By William Hugh Gower.

Portlandia.—This is a superb family of plants, belonging to the *Cinchonaceæ*, and named in honour of the Duchess of Portland. These plants enjoy abundance of heat and moisture. Pot in a compost of peat, loam, and sand. Stove.

P. coccinea—a dwarf species with opposite ovate coriaceous leaves, dark shining green; flowers trumpet-shaped, with a spreading limb, bright scarlet. Summer and autumn months. Jamaica.

P. grandiflora—this species attains a height of twelve feet or more; leaves opposite, lanceolate-elliptical and shining dark green; flowers axillary, trumpet-shaped, nearly six inches long, with a five-lobed spreading limb, fragrant and pure white, with a faint stain of red inside the tube. Summer months. Jamaica.

P. platantha—this is both dwarfer and a more abundant bloomer than the preceding species; leaves broad, obovate elliptic, coriaceous and rich bright green; flowers axillary, the lobes of the limb large and spreading, pure white. Summer months. Tropical America.

Pothos.—A genus of climbing Orontiads, which may be used to advantage either as basket plants, or for covering walls in the stove; they are also very ornamental when climbing up tree-fern stems, or in any similar situations. They enjoy shade, heat, and moisture; pot in rough peat and sphagnum. Stove.

P. aurea—a handsome plant having much-branched stems, which support large unequal cordate leaves; ground-colour dark green, irregularly banded, mottled, and splashed with golden-yellow and creamy-yellow. Solomon Islands.

P. celatocaulis—this plant lies perfectly flat upon the stems of whatever it may climb; the leaves are dark green, and have much the appearance of a Marcgraavia.

P. flexuosus—the leaves of this plant are alternate and arranged in a two-ranked manner, oblong, about six inches in length and light green. East India.

P. pictus—leaves somewhat ovate, deep green, marbled with silvery-white. Java and Borneo.

Psychotria. — A small genus of Cinchonads, which are not remarkable for beauty in either leaves or flowers; but the species introduced here is so extremely elegant, with its large bunches of berries, that it should not be absent from any collection of stove plants; it may be either grown as a basket or pot plant. Pot in peat and loam with a little sand. Stove.

P. cyanococca. — Leaves rather small, somewhat ovate lanccolate; flowers white, inconspicuous, followed by large bunches of the most brilliant ultramarine berries, which ripen in autumn and remain on the plant all the winter. Nicaragua.

Ravenala.—A genus of *Musaceæ*, containing but one species, sometimes called *Urania speciosa;* it requires strong heat and moisture, and should be potted in rich loam. Stove.

R. Madagascariensis — the Traveller's Tree—is a bold plant, somewhat resembling *Musa ensete;* the base of the leaf is sheathing, and if pierced yields a quantity of fresh and pure water, most welcome to thirsty travellers; most effective in a large house, owing to the peculiar distichous arrangement of its enormous blue-green leaves. The flowers are not conspicuous. Madagascar.

Reidia.—A genus of *Euphorbiaceæ*, very nearly allied to Phyllanthus; it contains several species, which resemble each other closely. The species here introduced is admirably adapted for dinner-table decoration in the day time, but from its habit of closing its leaves and sleeping at night, it is not effective after dark. Pot in loam and peat, drain well, and water freely, or red spider will destroy its beauty. Stove.

R. glaucescens.—An elegant slender shrub, with red branches, bearing numerous thin, oblong, entire leaves (which are so arranged as to present the appearance of a pinnate leaf); these are light green above, glaucous beneath; the flowers are produced from the axils of the leaves on slender red peduncles, pendulous and bell-shaped, fringed round the edge, yellowish-red, forming a continuous line of pendulous bells all along the back of the slender branches, rendering the plant very attractive. It blooms several times during the season. Siam.

Rhopala.—A genus of Proteaceous trees, of great beauty; when cut the wood has a heavy smell, somewhat resembling boiled beef. When growing Rhopalas require the heat of a stove, but when the young wood is mature they may be removed to the conservatory without injury. Pot in equal parts of loam and peat, adding a little sand.

R. aurea—a fine tree with pinnate leaves; the large leaflets are oblique and serrate at the edges, deep green on the upper side, paler beneath; the stem and young growth are covered with short golden-yellow wool. Brazil.

R. Corcovadense — leaves pinnate, leaflets oblong-acuminate, with an oblique base and serrated edges; deep bright green, the reverse side paler, stem and young leaves covered with rich brown wool. Brazil.

R. Jonghei—this fine species may be compared to a gigantic form of the preceding, which it resembles saving in size, and being of a brighter shade of green; it is the finest species of the genus yet introduced. Brazil.

R. Skinnerii — leaves pinnate, slender, with narrow leaflets, which taper to a point, and are serrate at the edges, the upper side being deep green, paler beneath. Guatemala.

Rhynchospermum. — More correctly Parechites, but usage has so thoroughly connected the name with this plant in the horticultural world, that we retain it here; it must not, however, be confounded with a genus of the same name belonging to *Compositæ*. The genus now under consideration belongs to the order *Apocynaceæ;* the species are woody climbers, producing Jasmine-like flowers. Pot in peat and loam in equal parts, adding a little sharp sand. In winter, Intermediate House; when growing, stove.

R. jasminoides.—A woody climber with opposite leathery-green leaves; the flowers are produced in clusters at the ends of all the branches, pure white, and very fragrant. It is a beautiful plant for a rafter, or grown in a pot, trained over a balloon-shaped trellis. It is also known as *Parechites Thunbergii.* Winter and spring months. Japan.

Rivinia.—A small genus of undershrubs belonging to the order *Phytolaccaceæ*, or Bloodberry family; they are less conspicuous for their flowers than their numerous highly-coloured berries, about the size of small Peas; like many of these soft-growing undershrubs they require to be well cared for, or they present a wretched appearance. Pot in peat and loam; syringe freely, to prevent the ravages of red spider. Stove.

R. humilis.— A small shrub with slender branches, and soft, alternate, light green leaves. It has long spikes of small white flowers, which are succeeded by bright scarlet berries; these remain upon the plant for months. Tropical America, &c.

R. tinctoria.—In growth and general appearance resembling *humilis;* the berries, however, are deep rich purple. Tropical America, &c.

Rogiera.—This must not be confounded with the genus *Rogeria;* it belongs to the order of Cinchonads, and is very ornamental. Pot in peat, leaf-mould, loam, and sand, in about equal parts; water moderately. Intermediate House.

R. gratissima. — Leaves opposite, coriaceous, and deep green; flowers produced in large terminal

corymbs, similar to an Ixora, rosy-pink in colour, and very fragrant. It is almost a perpetual bloomer. Las Caipas.

Rondeletia.—A large genus of handsome flowering shrubs, belonging to *Cinchonaceæ;* they have opposite leaves, and dense branched heads of showy flowers, usually terminal, but sometimes axillary. Pot in equal parts of loam, peat, and sand; drain well, and water liberally. Stove.

R. Purdei—leaves oblong-lanceolate, obtuse, deep green above, paler below. Flowers pale yellow or lemon-colour, very sweet, produced in dense terminal and axillary columns. Summer months. New Grenada, &c.

R. speciosa—this is said to be more correctly named R. odorata. Leaves opposite, ovate-cordate, somewhat rugose, and dark green. Flowers rich vermilion with a deep orange-yellow eye. Summer and autumn months. Havana.

R. speciosa major—similar to the preceding, but the flowers are brilliant scarlet with orange eye. Summer months. Havana.

Ronnebergia.—This is a commemorative name, and the genus comparatively new. It belongs to the *Bromeliaceæ*, and should have the same treatment as recommended for *Tillandseæ*. Peat and a little loam.

R. Morreniana.—Petioles sheathing, channelled; leaves oblong-acuminate, a foot long, and four inches broad; ground emerald-green, banded with blotches of deep olive-green. Spike erect, clothed with large green bracts, which decrease in size as they reach the scape, which bears a dense head of flowers, with light green sepals and tubular white petals, the latter spreading and broadly margined with azure-blue. Tropical America.

Rudgea.—A genus of *Cinchonaceæ*, most being shrubs, but some few attain the dimensions of trees. Pot in loam and peat; they enjoy strong heat and a moist atmosphere. Stove.

R. macrophylla.—A beautiful shrub with large obovate-lanceolate leaves, which are some two feet in length, smooth, shining, and dark green. Flowers white, produced in very large and dense globose heads. Spring and summer months. Rio Janeiro.

Saccharum.—These are gigantic Grasses, popularly known as Sugar Cane, and a most important economic plant, as producing the best sugar of commerce. As garden plants, the various species are extremely ornamental. Pot in loam, peat, and leaf-mould in equal parts.

S. officinarum.—The Sugar Cane is a tall Reed-like Grass, attaining a height of about twelve feet, producing in abundance large feathery plumes of flowers; the leaves are long, broad, and deep green, beautifully recurved. Sugar is the expressed juice, and the plant has been cultivated from time immemorial; it was evidently known to the Jews, for Jeremiah speaks of the "sweet cane from a far country" being sent as a present.

There are many varieties and species of this genus in tropical countries: one variety, *S. violaceum*, having deep violet-purple stems, is very handsome. Tropics.

Sanchezia.—A genus of Acanthads, remarkable for rich variegated foliage and handsome flowers. They resemble Aphelandras in general outline, and are easily grown into fine specimens, luxuriating in strong moist heat. Pot in peat and loam in equal parts, adding a little sharp sand.

S. glaucophylla.—Leaves opposite, obovate-oblong and acuminate in shape, about twelve inches long; dark green, midrib rich crimson, the primary veins broadly banded with yellow. Ecuador.

S. nobilis variegata.—Stems broadly winged, leaves opposite, obovate-oblong and acuminate, twelve to eighteen inches long; ground-colour brilliant green, the midrib and all the primary veins banded with rich yellow. It also produces large racemes of gorgeous orange-yellow flowers. Spring and summer months. Ecuador.

Sarracenia.—A curious and beautiful genus of Carnivorous plants, which give their name to the order *Sarracenaceæ;* popularly they are known as Side Saddle Plants, and North American Pitcher Plants. Their leaves are hollow cylinders, with a jointed lid at the top, which is closed down until the leaf attains full size, when it springs open, never to close again. These leaves contain a liquid which attracts flies and other insects in vast quantities; ingress is very easy, but as the inside is lined with sharp hairs, all pointing downwards, exit is impossible, and the pitchers are oftentimes half full of dead insects, upon which they are said to thrive. There are but a few species, but on account of their peculiar structure, and the varied and beautiful markings of their pitchers, they have become exceedingly popular, and many improved garden varieties have been raised by cross-breeding. Naturally, they grow in the bogs and swamps of North America, and are looked upon as green-house plants, but as they are there subjected to almost tropical heat in summer, they really thrive best in the Intermediate House in winter, and the stove in summer.

S. Atkinsonii—pitchers erect, long and narrow; green, netted with red; lid broad, ribbed and veined with red. Garden variety.

S. atrosanguinea—pitchers erect, long and narrow, with a broad round lid, which, when young, is green, changing with age to deep blood-red. North America.

S. Chelsoni—pitchers some-

what decumbent, long and narrow, and very highly coloured, being streaked and mottled with red and purple. Garden variety.

S. crispata—pitchers erect, upper part, with lid, netted with red. North America.

S. Drummondii — pitchers erect, bright green; upper portion, and the large recurved lid, beautifully spotted and netted with red and white, and suffused with crimson. There is a form called alba, in which the upper portion is spotted with white only. Florida.

S. excellens—pitchers erect, green, spotted with white, the upper portion netted and mottled with deep purplish-red. Garden variety.

S. exculta—pitchers erect, lower portion green, above marbled with white, and netted with crimson. Garden variety.

S. exornata — pitchers slightly decumbent, dark green, veined with purple; lid erect, broadly veined with purplish-red. Garden variety.

S. flava—so called from the colour of its flowers. Pitcher erect, of a uniform apple-green; in the variety picta, the throat is beautifully netted with crimson; in the form called maxima the pitchers are very stout, plain green, with a white throat, and an enormous lid. North America.

S. formosa — pitchers incurved and stout; green, changing with age to rich reddish-purple. Garden variety.

S. illustrata—pitchers erect, apple-green, strongly netted with deep crimson. Garden variety.

S. Maddisoniana—pitchers short, broad, and incurved; green, veined with red; lid large, and incurved, green, richly veined with purple. Garden variety.

S. Mitchelliana — pitchers curved, green, beautifully netted with fine red lines, changing to reddish-crimson; lid large and waved, broadly netted with deep crimson. Garden variety.

S. Mooreana—a cross between flava and Drummondii, and partaking of the characters of both parents.

S. psittacina—"The Parrot's Beak." Pitchers decumbent, winged in front, the lid forming a complete hood; green, veined with crimson; when young, the upper part is mottled with white, changing with age to brilliant crimson-scarlet. Florida.

S. purpurea—"The Side Saddle Plant," so called from the large purple petals, which hang from the side of the umbrella-shaped disk of the flowers, and which have been compared to a riding habit; pitchers stout, decumbent, winged in front; deep reddish-green; lid erect, streaked and veined with rich crimson; in the variety viridis, the whole plant is of a uniform bright green. North America.

Sarracenia Flava.

S. rubra — pitchers erect, slender; bright green, profusely streaked with crimson; lid small; flowers deep reddish-purple, and very fragrant. Florida.

S. Stevensii—pitchers large, erect; green, veined and netted with intense deep crimson; lid large and waved. Garden variety.

S. Swaniana — pitchers slightly decumbent, winged in front, of a uniform purplish-green; lid netted with crimson. Garden variety.

S. Tolliana—pitchers erect, long and narrow, broadly winged; deep purplish-red, with darker veins. Garden variety.

S. variolaris—pitchers erect, the lid forming a hood over the orifice, broadly winged in front; pale green, the upper portion mottled with white. N. America.

S. Williamsii — pitchers erect, having a broad-winged lid; light green, veined and netted with crimson. North America.

S. Wilsoniana — pitchers erect, and short; green, broadly veined with deep crimson, winged in front, purplish, the large lid being netted with purplish-crimson. Garden variety.

Scutellaria.—Popularly known as Skull-cap; they belong to the *Labiatæ*, and contain many very handsome flowering plants. They are easily grown, but require frequent stopping to induce them to make lateral shoots, by which means a succession of flowers is maintained, and the plants form better bushes; red spider is a great pest to these plants, therefore keep the atmosphere moist. Pot in loam, peat, leaf-mould, and sand, about equal parts. Intermediate House.

S. aurata — leaves oblong-cordate, bright green; flowers tubular, on long terminal racemes; yellow, deeper at the apex. Mexico.

S. cordifolia—leaves heart-shaped, deep green; the flowers orange-scarlet. Autumn months. Mexico.

S. Costaricana — leaves ovate-lanceolate, and deep green; racemes long and dense; flowers rich crimson, orange-yellow on the lip. It is a perpetual bloomer. Costa Rica.

S. incarnata — leaves cordate, dark green above, hirsute below; racemes dense; flowers soft rose-colour. A perpetual bloomer. Brazil.

S. Mocciniana—leaves ovate-acuminate, deep green, slightly hairy on the upper side; racemes dense; flowers large, tube orange-scarlet, lip deep yellow. A perpetual bloomer. Mexico.

S. Ventenattii—leaves ovate-acuminate, dark green; flowers bright rich scarlet. A perpetual bloomer. Brazil.

Siphocampylus.—A genus of *Lobeliaceæ*, deriving its name from the shape of the corolla, which is a curved tube. They contain many species with handsome flowers. The flowers are tubular, and curiously curved, with a fine cleft limb, which is two-tipped. The plants are easily grown, and should be potted in two parts of peat, one of loam, and one of sand. Intermediate House.

S. amœnus—leaves oblong-lanceolate, deep green; flowers deep orange and red. Spring and summer. Brazil.

S. giganteus—flowers very

large, red and bright yellow. New Grenada.
S. Humboldtianus—flowers pendulous, tube long; brilliant scarlet, throat orange. Peru.
S. microstoma—the flowers are produced in closely-packed corymbs; brilliant crimson. Winter months. New Grenada.

Sonerila.—A large genus of dwarf-growing East Indian Melastomads; most of them have showy violet-purple, but very fugitive flowers, but they are much prized for the beautiful markings of their leaves. Pot in peat, leaf-mould, and sand, in equal parts; drain well and water freely in summer. They should be placed close to the glass, but shaded from the full sun. Among the best flowering kinds are *grandiflora*, *speciosa*, *elegans*, and *Bensonii*.

S. Hendersonii — stems crimson, and leaves opposite, ovate-lanceolate; deep green, profusely blotched and spotted with silvery-white.
S. Hendersonii argentea—stems crimson, leaves opposite, whole leaf suffused with silvery-white, which nearly obliterates the deep green of the ground-colour.
S. Madame Ed. Otlet—leaves almost emerald-green, profusely blotched and spotted with metallic white, ribs on the under side crimson.
S. Madame Victor Alesch—ground-colour of leaves deep olive-green, midrib crimson; in some leaves nearly the whole surface is suffused with silvery-grey, while in others it is blotched and spotted with white.
S. Mamei—leaves intense deep bottle-green, with a satiny hue, and profusely spotted with pearly white.
S. Margaritacea—stem scarlet, leaves deep glossy green, dotted with pearl-like spots between the veins.

Spathiphyllum.—A genus of bold-growing plants belonging to *Orontiaceæ*. Pot in rough peat and loam. They enjoy strong heat and moisture. Stove.

S. pictum.—A large plant, with broadly-ovate leaves; ground-colour bright shining green, much blotched with light green and golden-yellow. Tropical America.

Stapelia.—A very extensive and singular genus of Asclepiads, having quadrangular, fleshy stems, which are quite destitute of leaves; they produce handsome star-shaped flowers from the sides of the stems, which usually have an offensive odour, so like decomposing meat that the name of Carrion Plants has been given to the family. Pot in sandy loam and old brick rubbish in about equal parts, and water sparingly during the summer, and only sufficiently to keep the stems from shrivelling in winter. Natives of South Africa; green-house treatment in summer; in winter they require dry stove temperature, or their flowers will not expand. The following is a good selection :—

S. ambigua.
S. Asterias.
S. bufonia.
S. ciliata.
S. deflexa.
S. gemmiflora.
S. glandulifera.
S. grandiflora.
S. hamata.
S. hirsuta.
S. incarnata.
S. lepida.
S. Marmorata.
S. Massonii.
S. pedunculata.
S. Plantii.
S. pulchella.
S. punctata.
S. rufa.
S. rugosa.
S. sanguinea.
S. trimaculata.
S. variegata.
S. verrucosa.

Stephanophysum.—A genus of Acanthads, containing some showy species, the one here named being a winter flower.

S. Baikiei.—Leaves large, opposite, ovate-acuminate; deep green and rough on the upper side; flowers tubular, some two inches long, produced in the greatest abundance in dense branching racemes; deep crimson-scarlet. Winter months. West Africa, probably.

Stephanotis.—A genus of climbing Asclepiads, only one species of which is at present in cultivation, and that should find a place in every stove. The Stephanotis is invaluable for training up a pillar or rafter, or covering a balloon-shaped trellis. Pot in turfy loam, adding a little peat and sharp sand; drain well and water freely when growing; in autumn reduce the water supply and temperature.

S. floribunda is a scandent plant, with opposite, ovate, deep green leaves; the tubular flowers are produced on the young growths in dense umbels; a pure waxy-white, and deliciously fragrant. The variety *Elvastoniana* flowers freely on small plants, and in far greater profusion than any other form. Spring and summer months. Madagascar.

Stigmaphyllon.—A genus of tropical American plants belonging to the order *Malpighiaceæ*, producing very ornamental yellow flowers. Pot in a compost of two parts loam, one peat, and one sand.

S. ciliatum.—Leaves palmately lobed, ciliated on the edges, and slightly glaucous; flowers rich orange-yellow, produced in large umbels. Summer months. Brazil.

S. Jatrophæfolium.—Leaves cordate, fringed at the edges, and glaucous; flowers large, umbellate, bright rich yellow. Summer months. Tropical America.

Strelitzia.—A genus of noble *Musaceæ*, named in honour of Queen Charlotte, who was of the Royal House of Mecklenburg-Strelitz; the species are all natives of South Africa, and need the temperature of the stove to develop their gorgeous flowers freely. The soil for these plants is a mixture of two parts loam to one each of peat and leaf-mould. Strelitzias are very effective in the sub-tropical garden in summer, but their broad leaves are very apt to get split and disfigured by the wind.

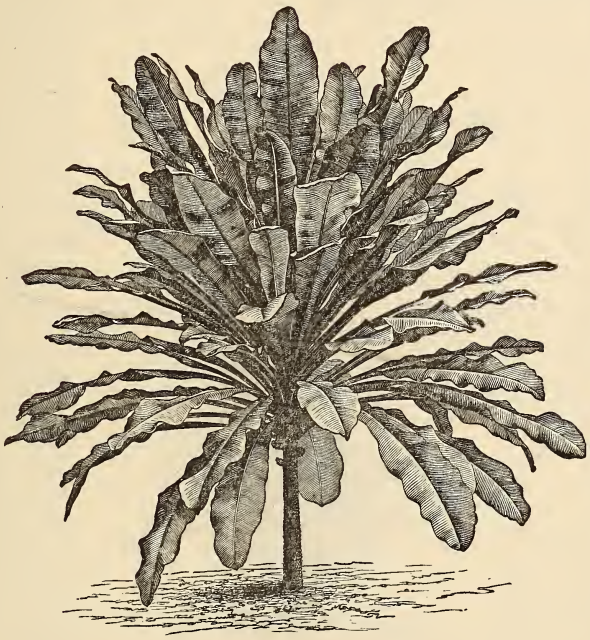
S. augusta — leaves two-ranked (distichous); the blade is upwards of two feet long, and about eighteen inches broad, thick, and leathery in texture, and deep green, supported on foot-stalks some three or four feet in length. The flower-stem is erect, terminated by a large boat-shaped spathe, from

which the white flowers expand. Summer and autumn months. S. Africa.
S. humilis—a dwarf plant, which may be compared to a miniature S. Reginæ, and therefore suitable for a small house.
S. Nicolai—a tall species, with large, oblong, glaucous leaves; the flowers are bright blue and white, tinged with pink.
S. Reginæ—this is the most showy species, growing to a height of about six feet, the leaves being coriaceous in texture and glaucous, the rich orange and vivid blue flowers resembling the plumage of a gay-coloured macaw.

Streptocarpus. — Soft-wooded, small-growing plants, belonging to the *Cyrtandreæ* group of the order *Gesneraceæ*, with opposite leaves, one of which is always much larger than the other. Pot in peat, leaf-mould, and sand in equal parts; they enjoy a moist and shady situation, but do not thrive if they are frequently syringed. Stove.

S. Rexii.—A low-growing plant, with oblong-obtuse, pale green leaves, and long funnel-shaped flowers, with a spreading limb, soft blue and lilac in colour. South Africa.

S. Saundersii.—This plant appears to have but a single leaf, upwards of a foot long and six inches broad, which seems to be developed at the expense of the opposite one; thick and fleshy; deep green, the under side dull red; panicles erect, numerous and much branched, bearing many pale blue flowers, with a brighter blue throat. Natal.



Theophrasta Macrophylla.

Tabernæmontana.—A genus belonging to the Dog-bane family, *Apocynaceæ*, containing many species, the most beautiful of which are here enumerated. They require treatment similar to Gardenia.

T. Barteri—a small branching shrub, with opposite, oblong-ovate, smooth deep green leaves; flowers tubular, with a spreading limb of five deep lobes, some three inches in diameter, pure white, and fragrant. Spring months. Old Calabar, West Africa.
T. coronaria flore-pleno—a compact much-branched shrub, with deep shining green leaves, and double pure white flowers, which are very fragrant, much like Gardenia, and are used for similar purposes. Winter and summer months. West Indies.
T. grandiflora—leaves sub-ovate and brilliant green; flowers tubular, with a spreading limb, rich deep yellow. Autumn months. Venezuela.

Terminalia.—A genus of *Combretaceæ*, containing many species, attaining the size of trees with age; extremely ornamental in a young state. Pot in equal parts of loam, peat, and sand; they enjoy a high temperature and moist atmosphere. Stove.

T. elegans.—An elegant pyramidal shrub, in a young state, with trifoliate leaves; the leaflets long, narrow, and acuminate; bright green, beautifully netted with reddish-brown, the midrib deep red. Madagascar.

Theobroma.—A genus of *Byttneriaceæ*, containing but few species; the seeds of the one here described yielding the chocolate of our shops, millions of pounds of which come to Europe annually, chiefly from Trinidad, Jamaica, and Grenada. Pot in rich loam, peat, and leaf-mould. Theobromas enjoy strong heat, shade, and moisture.

T. cacao.—A small branching tree, usually attaining a height of fifteen to twenty feet; the leaves are large, oblong-acuminate, light green; when young, very ornamental, and quite distinct from anything else; the flowers are produced on the stem and branches, are small and inconspicuous, and succeeded by long pod-like fruits, containing half a hundred or more of the seeds, which are called Chocolate Beans. Tropical America.

Theophrasta. — Handsome ornamental-leaved plants belonging to the order *Myrsinaceæ;* flowers showy in the mass, though individually small. Pot in peat and loam in equal parts, adding a little sharp sand. Stove.

T. imperialis—leaves alternate, somewhat spathulate, about three feet long and eight inches across, armed at the edges with sharp spines. Brazil.

T. Jussieui—this plant is known in its native country as "Le petit Coco;" it is a very distinct and handsome plant; leaves oblong-obtuse, about two feet in length, and three inches across, and deep green; they are profusely armed on the edges with sharp rigid spines. San Domingo.

T. macrophylla — leaves about two feet long, ob-ovate-lanceolate, serrate at the edges, rich deep green above, paler beneath. It produces great quantities of orange-yellow flowers on long spikes. Brazil.

Thunbergia.—Climbing plants belonging to the order *Acanthaceæ*, containing several gems of great beauty. Pot in loam and peat in about equal parts, adding some well-decomposed manure and sharp sand. These plants require frequent syringing to keep them free from red spider.

T. fragrans—a climber with small, dark green leaves, and pure white tubular flowers, quite destitute of fragrance. Winter months. East Indies.

T. Harrisii—a bold, strong-growing climber, with large, ovate-lanceolate, dark green leaves, and long ra emes of bluish-purple flowers, with pale yellow throats. Summer and autumn months. Moulmein.

T. laurifolia—less floriferous than the preceding, which it much resembles, but the flowers differ in colour, being soft pale blue on the limb, with a yellow throat. Malay Peninsula.

Thyrsacanthus.—A genus of showy plants belonging to *Acanthaceæ*. Pot in a compost of equal parts of loam, leaf-mould, and thoroughly decayed manure; grow freely and rapidly.

T. Schomburgkianus.—A free-growing plant, with oblong-lanceolate, acuminate, deep green leaves; the flowers, which are produced in very long pendulous racemes, are tubular and bright scarlet. Winter and spring months. New Grenada.

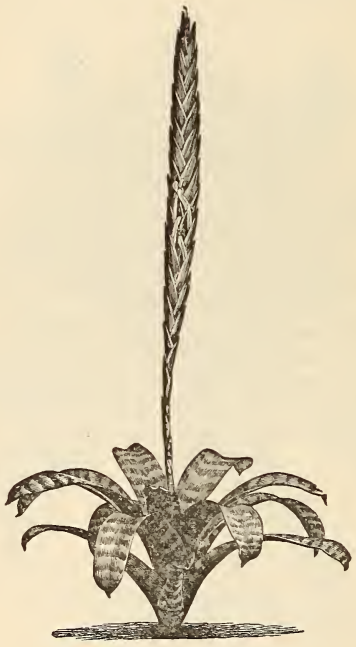
Tillandsia.—This genus commemorates Elias Tillandsius, author of a Flora, and Professor of Physic at Abo.

Tillandsias grow naturally upon rocks, and the stems and branches of forest trees; their rosulate growth, and the imbricating bases of the leaves, enable them to store up so much water that they can endure long droughts with impunity. Peat and sphagnum moss, with good drainage.

T. argentea — this plant thrives best treated as an epiphyte; it is an elegant little rosette, with the appearance of frosted silver; leaves some eight inches long, or even more, recurved at the ends, the whole surface being covered with sparkling silky white hairs. The flowers are inconspicuous, but very fragrant. Brazil.

T. dianthoidea—a small compact plant, with close, dense, deep green, smooth leaves, overspread with a thin white scurf. Flower-spike erect, furnished with pale pink bracts, between which the deep violet flowers protrude. Spring and summer months. Brazil.

T. Lindenii—when in flower one of the most beautiful plants in the whole order; it is often called Lindenii vera, to distinguish it from another distinct form when in flower, but which is scarcely different in foliage, and which we have found under the name of Morrenii, a name retained here. T. Lindenii is a compact and dwarf plant, with light green leaves, streaked with reddish-brown. Flower-spike much longer than the leaves, crowned with a long ovate spike of deep rose-coloured bracts, between which the large flowers protrude; these are made up of three broad petals of a rich vivid blue, white at the contracted base, thus forming a well-defined eye. Summer months. Peru.



Tillandsia Splendens.

T. Morrenii—the chief distinction in this species is that the stem does not rise so much above the foliage, and the spike of flattened bracts is broader and bright rose, flowers lilac, without the conspicuous white eye. Summer months. Peru.

T. mosaica—leaves broadly strap-shaped, recurved at the ends; ground-colour a yellowish-grey green, marbled and tessellated with olive-green, tinged with red; scape erect, bronzy-red; flowers yellow, tipped with white. New Grenada.

T. pulchella — an elegant plant, thriving best when grown upon a block; it seldom exceeds six or eight inches in height; deep green leaves, covered with a white scurf; flowers white, enclosed in large red bracts. Winter months. West Indies.

T. recurvifolia—similar in growth and size to the preceding, with glaucous leaves; flowers white, set in large bright rosy-pink bracts. Winter months. Panama.

T. stricta—an epiphytal dwarf and beautiful species, with strap-shaped leaves, covered with a white scurf; flower-spike longer than the leaves; bracts large, creamy-white, suffused with deep rose; flowers white and violet, becoming red as they decay. Winter months. Brazil.

T. xiphioides—a small but elegant kind; leaves broadly subulate, covered with short silvery-grey hairs; spike longer than the leaves, clothed with numerous long bracts, which are yellowish-green; flowers numerous, large, pure snow-white, and very fragrant. Winter and spring months. Mendoza, South America.

T. Zahnii—this beautiful plant thrives best in a pot; leaves deep amber when young, streaked with red veins; this colour with age becomes almost scarlet; flower-stem clothed with numerous long and pointed scarlet bracts; the flowers are numerous and golden-yellow. Spring and early summer. Chiriqui, Central America.

Torenia.—A genus of *Scrophulariaceæ*, in which there are several species. Habit spreading, pendent, suitable for hanging baskets; equal parts of peat and loam, with a little sand, suits them best. They enjoy strong heat and abundance of moisture. Stove.

T. Asiatica—leaves opposite, cordate-acuminate, serrate at the edges, and light green; flowers tubular, with a four-lobed spreading limb; rich deep purple, tipped with white. All the spring and summer months. East Indies.

T. Bailloni—similar in habit to the preceding; tube inside and out dull brown, limb orange-yellow. Summer months. East Indies.

T. Fournierii—more erect habit, and annual; flowers pale blue, three lobes of limb porcelain stained in front with yellow. Summer months. East Indies.

T. hirsuta—a trailing plant, in general appearance very like T. Asiatica; flowers reddish-purple, with a white lip. Summer and autumn months. East Indies.

T. pulcherrima — flowers large, rich violet-purple and white. Summer and autumn months. East Indies.

Toxicophlæa.—A genus of *Apocynaceæ*, from South Africa; one species, *T. Thunbergii*, is the "Gift-boom," or "Poison Tree," of the colonists, and the Caffres are said to have used a decoction of the bark for poisoning their arrows. The plant here described is highly ornamental; pure white; flowers in winter. Pot in loam and peat, with a little sand; when growing, stove; afterwards, Intermediate House.

T. spectabilis. — A much-branched shrub, with opposite dark green leaves; flowers in large clusters in the way of an Ixora; pure white, fragrant. Winter months. Natal.

Torenia Fournierii.

Tradescantia.—Commelynaceous plants of remarkable beauty, named in honour of J. Tradescant, gardener to Charles I. of England; popularly known as Spider-worts; they are, for the most part, much branched and trailing, consequently are admirably adapted for growing in hanging baskets. Peat and leaf-mould in equal parts; water freely.

T. discolor variegata—the old form of this plant had leaves arranged in a rosulate manner, erect, and stiff; deep green on the upper side, vinous-purple beneath; in variegata the upper side of the leaf is diversified with longitudinal streaks of pale yellow. Mexico.

T. multicolor — with this may be associated T. zebrina, and several similar species which form splendid basket plants; the leaves are pale green, pellucid, beautifully diversified with white, rose, purple, and crimson; sometimes the leaves are wholly of one or other of these colours.

T. Warscewiczii—an arborescent species, becoming branched with age, leaves nearly a foot long, sheathing at the base, and recurved at the apex, forming an elegant vase-like plant; it produces a large much-branched panicle of purplish-lilac flowers, which, though small, are very effective on account of the density. Spring and summer months. Guatemala.

Vriesia.—A genus named in honour of Dr. W. de Vriese, once Professor of Botany in Leyden. These plants are very nearly related to Tillandsia, and require exactly the same treatment.

V. brachystachys—a small species, with leaves three to six inches long, and upwards of one broad, strap-shaped, recurved towards the ends; light green, slightly glaucous. Scape and spike double the length of the leaves, the latter ovate, made up of broad imbricating bracts, which are green and bright scarlet; flowers yellow, stamens exserted, yellow. Winter months. Brazil.

V. gigantea—this, as its name implies, is a large-growing species; leaves long and broad, strap-shaped, recurved at the apex and spreading; deep green, slightly tessellated on the upper side with a paler hue. Spike erect, bearing a massive scape, clothed with large deep rose-coloured bracts; flowers green, stamens exserted. Brazil.

V. guttata — leaves erect, spreading ligulate, with a much-enlarged base; deep green, slightly glaucous, and beautifully spotted with purplish-crimson on both surfaces. Tropical America.

V. psittacina—a dwarf plant with ligulate leaves, much enlarged at the base and furnished with a long stiff point at the apex, and pale green. Spike longer than the leaves, bearing on the top a broad distichous scape; bracts boat-shaped, basal half deep magenta, upper part light green; flowers yellow, each petal tipped with dark olive-green; very handsome. Winter months. Brazil.

V. psittacina, var. rubro-bracteata — plant similar to the preceding, but the scape is not closely two-ranked; bracts large, brilliant scarlet, flowers rich canary-yellow, tube open, stamens exserted. Winter months. Brazil.

V. sanguinolenta—a bold plant, with long strap-shaped leaves, suddenly contracted at the apex into a stiff point, spreading; deep green, profusely blotched and marbled from base to apex with dull crimson. Brazil.

V. speciosa—leaves broadly ligulate and recurved, upwards of a foot long; deep green, broadly striped with transverse bands of black on the under side. Stipe erect, bearing a large oval scape of closely imbricating vivid scarlet bracts; flowers white. Winter months. Brazil.

V. tessellata—a massive and handsome plant, with broad strap-shaped leaves, which are much enlarged at the base; ground-colour deep green, beautifully chequered with yellowish-green, and on the under side veined with rosy-purple. Tropical America.

Xanthorrhœa—the Grass-trees of Australia—belong to the order *Liliaceæ*. They are also known as "Black Boys," on account of the stems when left behind after a fire (which frequently occurs) resembling black men in the distance. From these trees are obtained two kinds of fragrant resin, called "Botany Bay Gum" and "Black Boy Gum," which has led to the name of "Grass Gum-trees," sometimes applied to them. These plants form stout Palm-like stems, from six to ten or more feet high, bearing on their

summit dense heads of grass-like leaves, which are several feet in length; the flower-spike springs from the centre, and rises from ten to fifteen feet high, resembling a gigantic Bull-rush (*Typha*). Stems of these plants must be of great age, as they have been cultivated for upwards of thirty years without the slightest sign of a stem appearing. Pot in loam, peat, and sand, in about equal parts. Stove.

X. arborea—leaves several feet long, triangular, and glaucous.
X. Australis—leaves plain, and sword-shaped.
X. bracteata—this does not form an arborescent stem; leaves triangular.
X. hastilis — stem short, leaves sword-shaped, glaucous.
X. minor—this, the smallest species, is quite stemless, leaves triangular.
X. quadrangularis — this, and arborea, are the tallest of the known species.

Zamia.—A genus of *Cycadaceæ*, having much the appearance of Cycas, and requiring the same treatment. Stove.

Z. calocoma—stem slender, leaves pinnate, base enveloped in woolly hairs, leaflets closely set, about ten inches long; deep green above, paler below. Tropical America.
Z. crassifolia—stem stout, leaves erect, leaflets dense, upwards of two inches long, petioles clothed with a white tomentum.
Z. debilis—a dwarf species, leaves about two feet long, leaflets some four or more inches long; deep green. West Indies.
Z. eriolepis — stem slender, petioles spiny, leaflets also slightly spiny; bright green.
Z. Fischeri — stem very short, whole plant smooth, thin in texture, and deep green. Tropical America.
Z. furfuracea — a small-growing plant with a short stem and long arching leaves, leaflets serrate at the edges. West Indies.
Z. integrifolia—stem slender, leaves some three feet long; deep green above, paler beneath. W. Indies
Z. Lindenii — a bold and handsome species, stem stout, leaves six feet long, leaflets dense, and brilliant green.
Z. Migueli — stem stout, leaves spirally twisted, leaflets long and narrow; bright green, the base of each being ivory-white, thus forming a broad band of white down the centre of the leaf. Queensland.
Z. Roezlii—a very distinct and handsome species, leaves upwards of six feet long, leaflets broad and falcate, curiously furrowed; when young the leaves are suffused with violet, changing with age to a beautiful polished green.
Z. Skinneri—stem slender, leaves about three feet in length, petioles armed with short spines, leaflets large and coriaceous, elliptical obovate, much furrowed, and bright shining green. Panama.
Z. Wallisi—leaves about six feet in length, leaflets very large, in many instances being upwards of eighteen inches long and six wide, very thick and leathery in texture, much furrowed; bright green. New Grenada.

THE HARDY FRUIT GARDEN.

By D. T. Fish, assisted by William Carmichael.

THE APRICOT.

BUT little is absolutely known in regard to the native country, or date of introduction into Europe, of this favourite fruit. It was assuredly cultivated in Europe, and in England, at a very early period, though neither its semi-tender character, nor the mode of its cultivation, was understood for many years afterwards. Possibly, however, the ancient horticulturists were more fascinated by its early flowering, which its name—Apricoke, as it used to be spelt—implies. The Apricot, while flowering earlier, can hardly be said to be any hardier than the Peach, and hence its blossoms are even more frequently blackened by spring frosts. Unless, therefore, in the most favourable localities, Apricots can only be successfully cultivated on south or west walls, and all the protective expedients recommended for the Peach on the open walls are equally, or more, necessary to command regular and full crops of Apricots.

The fruit, when well ripened, is among the most pleasing, luscious, and wholesome of all stone fruit, and there is no country that can grow such luscious Apricots as Great Britain. Those grown in France, Italy, and Spain, or even under glass in orchard or other houses in this country, are by no means equal in flavour to those gathered from our open walls.

Propagation is by seeds and budding. It may also be propagated by grafting, but as this method favours gumming, to which the Apricot is rather subject, it should not be adopted. Where Apricots are subject to gumming, or branch-perishing, the raising of the trees from seed is the best method of propagation. The proportion of fine varieties from seeds justifies the cultivator in adopting this mode of raising the trees.

Budding of Apricots on Apricot Stocks.—By adopting this sensible mode of culture the evils of incongruity between scion and stock are reduced to a minimum. The stones may be sown in the open ground so soon as ripe, say in September, or kept, either in a dry state or interlayered with earth, till February. Sow in drills a foot apart, and covered with four inches of soil. If sown in nursery beds, or lines, they may remain one, or at most two, seasons in the seed-bed, according to the growth made. Such seeds should be sown thinly to give the plants a vigorous start at once. In lining out, a yard between the rows, and a foot from plant to plant, are useful distances.

Budding does not differ from that of Peaches, Plums, or Roses, except in earliness. The Apricot being an early tree, the stock, or buds, will mostly be fit for budding early in June. For dwarfs a foot, or even less, from the ground will be found a suitable place for budding. For rider trees any height from two feet to four may be chosen. Only one bud is used, as a rule, but two, or even three, may be inserted if preferred.

Grafting.—When this is practised the scions should be taken off in December, and laid in the ground till the following February, the best season for grafting Apricots. Common whip-grafting is best, and the scions should be of medium-sized well-ripened wood, from four to six inches long.

Amateurs should purchase maiden trees ready worked to their hands, or seedlings, from those who make the raising of such for fruit-bearing a speciality.

In regard to site, south walls throughout many of the warmer parts of England are almost too hot for Apricots. The fruits are less highly flavoured; the trees lose branches, and perish sooner on south than on west or south-east walls. In colder climates, such as the North of England or Scotland, southern sites, or walls, are best.

The soil should be lighter than that recommended for Peaches or Pears. Loams running into sand rather than clay suit the Apricot best. What are called friable soils are, however, the most suitable. As to width and depth of borders, much depends on local climate, character of soil, height of wall, and other circumstances. From two feet to a yard are good depths for Apricot borders. The hotter and drier the locality, the deeper the border should be, and *vice versâ*. The width of the borders may range from six to twelve feet, according to the height of the walls to be clothed.

The Apricot not only starts early into growth in the spring, but also matures early in the autumn. The trees may, therefore, be planted through September, and ought not to be later than the middle of October, to insure a crop of fruit the following season.

Distance to Plant.—This should be closer than either Peaches or Pears, as the trees are mostly short-lived, and prone to die piecemeal from what is known as branch-perishing. An average of ten feet apart is consequently safer and more profitable than one of twenty, which is often recommended for fan-trained Apricots. Fan-shaped trees from ten to fifteen feet apart are, on the whole, the best; and in order to keep the walls fairly well furnished it is good practice to plant trees between them as soon as they fairly furnish their allotted spaces, so that the young ones may be ready to take their places in case of failure. With a few trifling exceptions the after-treatment and training will resemble that of Peach-trees.

Standard Apricots.—These are only possible in Devonshire, and other warm parts of the country, or under glass in orchard-houses. From three to seven feet are good and convenient heights for standards. Three, five, or seven branches form good bases for standard Apricot-trees. In orchard-houses bush-trees may often prove more convenient and equally fruitful.

Apricot-trees on Gable-ends.—A special mode of treatment and training is frequently adopted in cases where the side-roofs are carried a foot or more beyond the line of the gable-end. The trees are trained over the area in the usual way, and when the framework of a good fan-shaped tree is laid, the young wood is permitted to grow out at almost right angles from the wall to a distance of six inches or a foot, and at distances of a foot asunder, the tree thus assuming the character of a one-sided stumpy bush or standard. On Swiss, and other fancy cottages, with wide side-roof extensions over gable-ends, the writer has seen Apricot-trees projecting a full yard from the gable, laden with fruit from base to summit.

Apricot-trees Trained Fan-shape on Walls.—The only, or chief, difference between these and Peaches is that main and sub-branches should be kept at wider distances apart—from a foot to two feet between being close enough for Apricots. Apricots bear fruit on spurs, as well as on the young wood of the previous season, consequently space should be provided for the development of the dual mode of bearing.

Pruning.—Generally this may be said to resemble that of Peaches—which see. But the dual mode of bearing necessitates a difference in pruning. So far as the mere keeping up of a sufficient supply of young wood is concerned, the two kinds of trees may be treated alike, but for the development and maintenance in bearing condition of fruit-spurs on the older wood of the Apricot a rather different system must be adopted. And this should be borne in mind at the earliest period; hence, instead of disbudding Apricots, all superfluous shoots should be pinched back to one, two, or, at the very most, three leaves at an early period of their growth. These closely-stopped shoots form the basis of future fruit-bearing spurs. As the spurs grow too large they may be boldly shortened back. But this is better avoided, as large wounds on Apricots mostly result in canker or gum, and properly-managed Apricot-spurs seldom need such severe manipulation.

The moment a branch begins to flag, or become yellow, it should be cut off bodily. Summer is by far the best season for these surgical operations, as it affords greater facilities for healing, and young shoots may often thus be forced forth to fill the vacancies incident to branch-perishing.

As the Apricot is an early grower, and ripens its fruit in July and August, not only may its summer pinching and pruning, but most of what is called winter pruning, be completed during the growing season. As soon as the fruit is gathered, all superfluous or weakly-growing shoots, of any age or size, may be removed to afford more scope, and freer space, for the young wood already provided to succeed it in furnishing the trees, and in providing fruit-bearing wood.

Towards the end of August the shoots of the current year may generally be cut back to within a foot or so of their base. This will plump up and fill out the buds left, and result in a full show of strong blossom-buds the following spring.

Winter pruning is thus practically abolished. On the principle of letting well alone, the trees should be allowed to rest thus till the ensuing February or March, at which season they may be examined, knife in hand, for the removal, or cutting back, of any shoots injured by the winter, or any useless or ill-placed shootlet that may have escaped notice when the trees were pruned in full foliage in the autumn. This spring pruning also affords a good opportunity for the removal of ties or shreds, or the re-tying and training of the trees in cases where they may have been removed from the wall for the winter—as recommended for retarding Peaches.

Protection in the spring has been sufficiently described under Peaches. In the case of loose-trained trees backed up against the gable-ends of houses, or other walls, there is no protection so efficient as a thin screen of boughs placed on the tree itself, and among the outstanding branches. The projecting roofs, and the warmth of the chimney, where the latter runs up in the end gable, are, however, generally sufficient without any other protection. Trees of this form have also far greater self-protective powers than those displayed in single-branch file over the wall-surface.

General cultivation has also been treated of in regard to Peaches; but here one or two points need intensifying. The time of thinning should be early, the extent of it severe. Both considerations also receive additional enforcement from the fact of the usefulness of the thinnings. In not a few establishments green Apricots for tarts, and even for jam, are preferred to ripe; and yet no trees have suffered more from overcropping. Fortunately for the lovers of green Apricots, the fruit does not seem to strain or drain the trees very severely until the stoning period is reached, and three weeks before the stones harden, green Apricots are in the best possible condition for use. A fruit for every six inches of wall-space would be a heavy crop, provided the variety were of average size, as the Moorpark.

The trees should never be permitted to flag, nor the roots to suffer from any lack of water. Drought at the roots is also one of the main causes of the fruit dropping off prematurely. With the borders thoroughly drained, Apricots can hardly be overwatered during seasons of great heat and drought. Overhead delugings with the engine are also of great use in cooling and refreshing the tops of the trees, as well as keeping them clean, and enlarging the size of the fruits.

Few trees benefit more from a surface mulch of dung about three inches in thickness than Apricots, if the weather is hot and the crop large.

Unequal Ripening and Premature Rotting of the Fruit.—This is very prevalent in some localities. It may also result from sudden and severe changes of weather. But in many cases it is the result of the undue exposure of the fruit to the light and heat of the sun. This results in a partial scorching, or scalding, of the upper portion of the fruit. Abundance of healthy foliage and young wood checks or prevents the evil. Towards the latter stages of ripening it is also possible to expose more fully to the light the base or shady side of the fruit.

Certain varieties, such as the Royal, are more liable to unequal ripening, and premature rotting, than others. The latter is often induced by injury from careless handling, bruises from hailstorms, and the touch or tastes of wasps or flies. Though the punctures of the latter may be too small to be seen, wherever they touch such fruits decomposition follows almost immediately.

Gathering of Apricots.—Similar care should be taken in regard to the time and mode of gathering as already prescribed for Peaches. Gather in the cool of the morning, and keep in a cool cellar or room till wanted, if you would enjoy to the utmost the rich and full flavour, and indescribable aroma, of perfect Apricots.

Apricots in Pots.—So far as their culture in orchard-houses or other glass-houses is concerned, this has been already described. But Apricots may also be grown in pots in the open air. Capital fruit-bearing Apricots may be produced, and kept in good bearing condition for some years, in twelve, fifteen, or eighteen-inch pots, or tubs, and thus a highly ornamental free-blooming tree, as well as luscious fruit, enjoyed on balconies, or in areas or yards. The pots should be crocked with smashed bones, filled with good loam, or other rich friable soil, mulched over the surface with rich manure, and copiously watered, and there need be little doubt of success.

Varieties of the Apricot.—Fortunately these are by no means numerous, and even of three dozen or so described, not more than a dozen varieties are worth growing. A few of these, again, are so pre-eminently superior that not a few cultivators only grow one, or at the most two varieties—the Moorpark and the early variety of the same. The latter is in most respects identical with the former, only three weeks earlier.

The Moorpark has also a good many synonyms, but can generally be had true from the trade under its common name of the Moorpark. It is a large, roundish, rather irregularly-shaped fruit, pale yellow on the shady, and rich orange suffused with reddish-brown on the sunny side; flesh juicy and vinous, of a deep orange-colour, separating freely from the stone; kernel bitter. Ripens in August and September.

The Peach Apricot is so much like the Moorpark as to be considered by many identical with it. And as both reproduce themselves pretty truly from seeds, the Moorpark is probably a seedling of the Peach, or *vice versâ*.

Hemskerk—this is another good Apricot, greatly resembling the Moorpark in all particulars down to the bitterness of its kernel. It, however, ripens almost a month earlier, and is a much hardier variety, far less liable to mildew and branch-perishing than the Moorpark.

Royal—this is another fine Apricot of the Moorpark type, that ripens early in August.

Kaisha—connoisseurs among Apricots mostly give the first place for quality to this variety. The fruit is of medium size, pale brown colour on the shady side, and of the same colour, mottled with red, on the sunny side; flesh clear pale yellow, almost transparent, of most rich and vinous flavour; the kernel sweet. Ripe towards the middle of August.

Musch-Musch—this is an Apricot of very similar quality to the Kaisha, though the tree is less hardy, and it is not nearly such a full cropper. The colour is a mixture of lemon and orange, with a slight tinge of red; the transparency of the flesh is more definite than in the Kaisha, and the quality of the flesh, and sweetness of the kernel, all that could possibly be desired. It ripens from the middle to the end of July.

To these may be added:—

Blenheim, or Shipley's—ripens about a fortnight before the Moorpark.

Frogmore Early—an early variety of excellent quality.

Large Early.

Large Red.

Orange—a clingstone, much valued for preserving.

Pine-apple.

Red Masculine.

Rivers's New Large Early—richer and earlier than the Large Early.

The Albergne and Breda may be added by those who wish to try the Apricot as a standard in warm nooks and corners in the open air. The former is a free grower and a great bearer, and comes almost true from seeds, kernels of which are bitter; the flesh clings to the stone, is of deep orange-colour, with a peculiar perfumed flavour. The latter is also very choice, with a kernel sweet as a filbert; the flesh is deep orange, and highly flavoured, separating freely from the stone. Both of these varieties, or others under their names, have been much grown and greatly prized for preserving, but for dessert neither of them is comparable to the Kaisha, the Musch-Musch, or the Moorpark, with its several allies here enumerated.

Several varieties, such as the Golden Drop, and White Masculine, are omitted owing to the tender character of the trees. Turkey, Roman, Brussels, and others are omitted as being decidedly inferior to those here enumerated.

Diseases and Insects.—These are to a large extent similar to those that attack the Peach and Nectarine, though few of them attack the Apricot to the same extent. Aphides, or red spider, for example, seldom do much injury to Apricots, nor is the blistering of the leaves anything like so frequent, or so pronounced, as on Peaches.

On the other hand, the Apricot is very liable to a most destructive disease, that seldom attacks Peaches or Nectarines, nor injures them to the same extent. This is mostly known by the name of limb-perishing. Trees in full health and vigour to-day, suddenly flag in one or several limbs, or even throughout the whole tree, and in a week or so they are totally wrecked, or completely disfigured for life. There is really no cure for this most troublesome disease. The best preservatives are: deep, rather moist and cool borders; cool aspects; abundance of water to reach the lower roots; careful protection of the base of the main branches and boles of the tree with hay-bands, or other slow-conducting wraps, to protect them from violent extremes of heat and cold.

Canker is often developed simultaneously with limb-perishing, and doubtless at times produces it; removal of the cankered parts where practicable, and lifting and replanting the trees in fresh soil, may moderate the virulency, or even cure this dire disease. The same remedy, that of lifting and planting in new and better and deeper borders, not seldom cures mildew. As a local remedy sulphur-dusting is still the best we have to offer. The new preparation of sulphide of potassium (Harris) applied in a liquid state in the ratio of a quarter or half an ounce to a gallon of water, seems more speedily effective than dry sulphur. But over-cropping, and drought at the roots, are generally the radical causes of canker and mildew.

The most troublesome caterpillar on Apricots is the greenish-yellow *Ditula angustiorana*, which, with others, gives notice of its presence by binding the leaves or young shoots together with a glutinous web. The moment these are seen they should be collected and destroyed, thus preventing the moths being hatched, which mostly happens in June.

Ants, earwigs, wasps, flies, butterflies, birds, mice, rats, squirrels, snails, are equally troublesome, and even more destructive among Apricots than among Peaches and Nectarines, and must be destroyed by similar methods if perfect fruit is to be enjoyed.

BULBOUS PLANTS.

By William Goldring.

Gagea lutea.—This is a pretty native plant, with small yellow flowers in the way of the Star of Bethlehem. *G. serotina* and *triflora*, both European plants, are included now in the genus *Lloydia*.

Galanthus (*Snowdrop*).—A favourite with every one is our native Snowdrop. The double-flowered variety is even commoner in gardens than the single, and though showier is not so elegant. Besides the double form there are numerous other varieties of *G. nivalis* now in gardens; some common, others extremely rare. Among these are the following: *major*, of larger growth than the original, and with finer flowers; *angustifolius*, with narrower leaves; *Shaylocki*, or *virescens*, with a green blotch on the interior of each sepal; *quadripetalus*, flowers usually with four sepals instead of three; *serotinus*, a later-flowered form than the type; *poculiformis*, distinct from the original in having the petals of the same length as the sepals, and spotless; *Coreyrensis*, the Corsican Snowdrop; and *Octobrensis*, a form which usually flowers in autumn.

Besides these there are some distinct seedling varieties known under the collective name of *G. Melvillei*. There are four varieties, which vary chiefly in their time of flowering, but they are also altogether finer in flower than the ordinary Snowdrop. The earliest of Melville's seedlings commences to flower in February, and is followed by the others in succession, on through March, and the beginning of April.

The following are the other species of *Galanthus* in cultivation:—

G. Elwesi is the latest addition to the list of cultivated Snowdrops, and a most beautiful plant it is, disputing with Imperati the place of being the finest Snowdrop. Its flowers are almost as large as those of Imperati, and the broad snow-white sepals being very concave give the flower a more globular form than other Snowdrops. The silvery glaucous and comparatively narrow leaves form a character by which this species may at a glance be distinguished from the rest. It flowers from February to April, about the beginning of March being its usual season.

G. Imperati—this is the largest and finest of all the Snowdrops, the flowers being fully thrice the size of the common kind, borne on stems often a foot high. The sepals are often an inch long, and proportionately broad; the foliage is also very large. It differs in no way from G. nivalis except in stature, and on this account botanists consider it only a variety of the common species, but from a garden point of view it is absolutely distinct, and the most desirable of all the Snowdrops.

G. latifolius, or Redoutei, is not a commendable plant, inasmuch as its flowers are small, though the foliage is extremely broad, and this character, combined with their deep green tint, separates it from the rest. It moreover flowers when most other Snowdrops are past.

G. plicatus—this, the Crimean Snowdrop, has been a tolerably common plant in gardens since the Crimean war, though it was introduced many years before that date. It is altogether a larger-growing plant than the common species, the leaves being very broad and characterised by their margins being turned back, hence the name plicatus. It is a hardy, vigorous, fast-growing, and free-flowering plant, and invaluable for the spring border. It flowers soon after the common kind commences.

Culture.—All the Snowdrops are of easy culture; any soil suits them, but they delight most in a sandy loam. The common kind, and its varieties, will grow anywhere, in the shade or in the open, in the border or in the wood, or in any nook or corner in the garden. Snowdrops may be grown in pots, window-boxes, vases, &c., for adorning conservatories and rooms. If tufts of bulbs are dug up from the open border in early autumn, potted, and placed in a frame, they will flower much earlier than those in the open. Snowdrops may also be forced into flower by Christmas time, though they do not lend themselves kindly to this treatment. The best plan is to lift tufts in autumn from the border, and without disturbing the clumps place them in pots or boxes in a slightly heated frame or greenhouse, but on no account place the pots in a stove or other highly-heated place, or leaves only will be forthcoming.

Galtonia (Hyacinthus) candicans.—One of the stateliest bulbous plants from the Cape of Good Hope. Its stems rise from two feet to even six feet in height, and carry spiry clusters of ivory-white bell-shaped flowers. It is quite hardy in the warmer parts of this country in the open air, if planted in light soils. Planted in well-drained, light, rich soil, it seldom requires more than protection during winter. It may be grown well in pots, and as it flowers in autumn it is valuable for the green-house.

Gastronema sanguineum.—A South African plant of rare beauty, nearly allied to *Cyrtanthus*. It has evergreen foliage like *Vallota*, and about the end of summer produces flower-stems about a foot high, bearing three or four funnel-shaped flowers, some two inches across, and of a rich colour, almost a scarlet. Flowering as it does in August and September, it is well worthy of good attention for adorning the green-house. A very beautiful hybrid has been raised by intercrossing *G. sanguineum* and *Vallota purpurea*, and is named *G. hybridum*. Gastronemas require the same treatment as Vallotas.

Gladiolus.—This genus is the largest in the Iris family, and numbers nearly one hundred species, all from Africa, with the exception of a few natives of Southern Europe. It is remarkable that so few species have been introduced that are sufficiently attractive to be worth cultivating; indeed, there appear to be only about a dozen wild species that

may be called garden plants. It is not the species, therefore, but the hybrids, that make the genus so important, and it is to the latter that most attention will be directed in these remarks.

The work of hybridising *Gladioli* appears to have commenced about half a century ago, for about that time two of the most valuable varieties were raised, which have since given us the magnificent race which we have at the present time. These were *Gandavensis* and *Brenchleyensis*, the first-named being the variety from which the numberless forms of the late-flowering race originated.

Hybrid *Gladioli* may be conveniently placed under two classes—viz., early-flowering and late-flowering sorts. These again may be divided into about half a dozen groups. These are: (1) *Colvillei*, (2) *Nanus*, (3) *Ramosus*, (4) *Brenchleyensis*, (5) *Gandavensis*, and (6) *Lemoinei*, the last-named group being the most recent. The first three groups are early-flowering, beginning to bloom in early June, and extending till the end of August, each group flowering in succession. The late-flowering group commences with *Brenchleyensis*, about the latter part of July, and soon after the *Gandavensis* race flowers, in company with the new *Lemoinei* race. These two latter groups continue to flower throughout September in the more northerly districts, so that by forcing the early section into flower as soon as April, *Gladioli* may be had in bloom for fully half the year.

Early-flowering Section.

These, as distinguished from the late flowerers, are smaller in growth. Their value lies in their adaptability for cutting, their spikes being slender, and not so massive as in the late sorts. They endure a long time when cut, as every bud on the spike expands. They are of easy culture, and are altogether hardier than the late sorts; and some even leave the bulbs in the ground from year to year. What are known as the *Colvillei* group are the earliest to bloom; then follows a group of very dwarf kinds, which have been collectively classed under the head of *G. nanus*. This group is followed in date of flowering by another group of taller sorts, which are classed under the head of *G. ramosus*. The *nanus* varieties range from twelve inches to eighteen inches high, and for the most part possess flowers bearing upon their lowermost petals the white blotches that characterise such species as *G. trimaculatus*, whereas in the taller and later-flowering *ramosus* varieties the blotches are generally coloured. The difference in the date of flowering between these two groups varies from two to three weeks, according to the date of planting.

G. Colvillei, which is the earliest, begins to flower in the open border about June, but it may be had in bloom several weeks earlier by potting bulbs, and placing them in a gentle heat. The white variety of *G. Colvillei*, commonly called "The Bride," is a deservedly popular flower, and as early as March potfuls of it may be had in bloom. The spikes being slender, and quite wreathed with pure white flowers upon their upper halves, are particularly valuable both for conservatory adornment and for cutting. The original form of *Colvillei* is also pretty, the colour being a rich carmine-purple, with the lower sepals blotched. If the potfuls of bulbs of this *Gladiolus* are introduced in warmth at intervals from February up till April, a continuous succession of flower-spikes may be obtained until the outdoor plants come into bloom. These forced bulbs should be treated like pot Hyacinths.

In the same category as *Colvillei* are several other varieties, the offspring of some of the European species, such as *G. communis*, *Illyricus*, *segetus*, *Byzantinus*, *imbricatus*, and others; but while they are desirable for the open border, they are not worth special culture. There is a conspicuous sameness about all the hardy kinds, all having slender spikes of reddish-purple flowers. They flower early in the summer, and while they last are attractive. The bulbs of all the foregoing kinds, as well as those of *Colvillei*, should be planted out of doors during October and November.

The *Nanus* and *Ramosus* varieties may for practical purposes be classed under one heading, as they require precisely the same treatment. Like *Colvillei*, and the other kinds mentioned above, they should be planted in autumn, the best time being during the month of October. A good plan of growing them is to plant the bulbs in beds about four feet wide, with a narrow path between each. In this case every plant can be reached, and protective material, if needed, can be easily put on the beds. The bulbs should be placed in drills about four inches deep, and it is all the better if a good layer of sand is placed both beneath and above the bulbs. Any light and rich soil suits them; poor soil should be enriched with well-rotted manure dug in, if possible, some time before the bulbs require planting. During the winter the bulbs will be growing, and if the weather is severe the beds should be protected by a surface layer of mulching material, such as stable manure. An open sunny spot should be chosen for the beds, and the results will be more satisfactory if the spot is sheltered from cold winds. If an early batch of flowering plants is desired, it only requires a frame to be placed over one of the beds. This protection will be sufficient to induce early flowering, that is, a fortnight or so before the unprotected bulbs will bloom.

The propagation of these *Gladioli* may be easily carried out by means of seeds and offsets, or bulblets, which are produced plentifully; seedlings may be raised and flowered in the third season if the seeds are sown as soon as ripe, so that the seedlings develop strength before the winter. The same plan of sowing may be followed as that recommended under the head of the *Gandavensis* group. The offsets from the parent bulbs should be detached at each lifting time, and after separating them into lots of two or three sizes, should be planted in October in beds by themselves. These will make flowering bulbs during the second and third seasons.

Varieties.—As in the *Gandavensis* group, the varieties of the *Nanus* and *Ramosus* groups are so numerous that it is difficult to make a short list of the best, but the following dozen may be relied on as being beautiful and distinct. Of the *Ramosus* section are *Queen Victoria*, fiery scarlet, blotched with white, as in the original *G. cardinalis; Delicatissimus*, rose-pink and white; *Formosissimus*, brilliant scarlet; *insignis*, vivid crimson, blotched with purple, one of the finest; *La Ville de Versailles*, pure white, with crimson blotches; *Van Speyk*, scarlet and white; *Lord Peel*, crimson-red, blotched with white; *Ne Plus Ultra*, deep rose; *Prince Albert*, scarlet and white; *Rosa Mundi*, deep scarlet, flaked with white; *Lord Auckland*, bright crimson and white; *Princess Marianne*, pale rose and crimson-blotched; *Princess Mathilde*, purple-rose, red-blotched.

Late-flowering Section.

The *Gandavensis* race is undoubtedly the most popular, as it is the most important of hybrid *Gladioli*, though it is only within the past twenty-five years that any great advance was made in the improvement of the typical *Gandavensis*, the forerunner of the race. This class of the *Gladiolus* has long been classed among florists' flowers, and a certain set of points has been laid down by florists, to which they consider a good variety should conform. A good *Gladiolus*, therefore, must have a tall, massive spike, firm enough to hold itself erect on an exhibition stand. The flowers should be large and well formed, that is, the six petals should be of rounded outline, thick in texture, and with the three upper petals symmetrical in size and form, and the lowermost petal, or lip, should be of the same size as the two on either side of it. There are no prescribed rules as to colour, except that the self-colours should be pure, and in the case of high colours brilliant, and when blotched, flaked, or marked, these colours should be well and distinctly defined; a good spike should carry not less than a dozen blooms, half of which should be expanded. It is difficult to see in what way this group can be further improved, except it be in regard to colour, for as yet there are scarcely any pure whites, and no yellows, though every shade of crimson, scarlet, red, rose, and pink has been obtained.

As cut flowers for room adornment there are no better flowers than these *Gladioli*, as they endure so long in good condition. If a spike is cut when it has but about half a dozen blooms expanded, the buds will expand in succession, till the spike is exhausted, although the last-expanded buds will lose somewhat in size and colour.

Culture.—In some localities, and even in some gardens in the same locality, the *Gandavensis Gladioli* are very capricious. In some they will grow and flower to perfection, while in others they refuse to grow. The reputation, therefore, that they possess of being difficult to manage is not unfounded. There can be no doubt that they are somewhat delicate, and require nicely adjusted conditions of treatment, and even when all prescribed rules are followed failures will occur. They succeed best in a moderately light and deep soil, well manured, and all the better if the position is sheltered from high winds, which are apt to injure the weighty spikes. But the spot must be exposed to the sun, as they are essentially sun-lovers, and will not thrive in shade. Like most plants of the Iris family, the *Gladiolus* likes plenty of moisture, so that the finest spikes are produced in gardens having what is termed a cool bottom. In preparing a *Gladiolus* bed the ground should be trenched, mixing at the same time with the soil a good dressing of decayed stable and cow manure. This should be done in autumn, say about October, or a little later, and during the winter it is advisable to fork the ground over once or twice in order to get it well mixed and suitable for planting, which should be begun about the second week in March. The best plan to follow in planting the bulbs is to draw drills about six inches deep. In these drills throw in a layer of sand, an inch or two in thickness, and on this place the bulbs about a foot apart. On the top of the bulbs place another layer of sand, and then fill in the drill with the soil, so that the bulbs remain about four inches below the surface. The rows may range from one foot to two feet apart, according to the space at command. Some plant in beds about four feet in width, planting four rows in each bed. Others again, instead of planting in drills, make holes with a trowel, and drop in the sand and bulb. Growers for exhibition are very particular about planting, and some even fill in the drill with fresh loam instead of the soil of the bed, so that the new rootlets of the bulbs have some good material to root into, and so gain vigour. If two or three plantings of

Gladiolus Hybridus Lemoinei.

bulbs are made at intervals of ten days, or a fortnight, the flowering period will be prolonged, which is desirable. The plan of growing *Gladioli* in beds is carried out chiefly by those who desire to produce the finest spikes possible, but those who regard this grand autumn flower merely for its decorative value, will find about their gardens numerous places where they would produce a fine effect: such, for instance, among Roses; among Rhododendrons that are thinly planted on the fringe of shrubs; in little groups by themselves; on a lawn; in fact, there is no place, provided the spot is suitable, where Gladioli would not produce a beautiful effect. In these cases the bulbs should be planted in clumps of from three to six, at distances of about a foot or so.

Varieties.—It is difficult to give a list of select sorts of *Gladioli*, as the named sorts alone number some thousands; therefore, the short list here given must only be regarded as representative of the very best kinds, both cheap and expensive. There is no other class of plants among which the price varies so widely. Some sorts may be bought for as small a sum as threepence a bulb, while others range as high as one and even two guineas a bulb. This difference in price arises from the fact that while some sorts possess the power of producing bulblets plentifully, so that a large stock may be propagated in a short time, others produce very few, and though they may have been in existence for years, they are, and probably always will be, scarce, for it need hardly be said that named sorts can only be propagated by means of bulblets, or spawn, as they are called. The Messrs. Kelway, who are by far the largest growers of *Gladioli* in this country, raise seedlings by the thousand, and it is from their nurseries that the bulk of the named *Gladioli* grown in this country are dispersed. Some 200,000 seedlings are raised annually, and these, after they have outgrown their infantile stage, are planted out in fields, and as they come into bloom they are inspected; if inferior to existing sorts they are either uprooted, or relegated to the stock which is sold as unnamed seedlings, only those that possess good qualities, and differ in some respects from the existing sorts, being named. After the seedlings are selected for names they are grown for successive seasons in order to obtain sufficient stock of each before they are put in commerce. The unnamed seedlings are sold at a much cheaper rate than those named, and among them may be found some which may please the cultivator quite as much as the named sorts at a guinea a bulb. The following list includes some of the finest *Gladioli* in existence, ranging in price from sixpence to half a guinea a bulb.

Abazca — maroon, white centre.
Acantha—pale lilac, flaked on lower sepals.
Ada — salmon-red, flaked carmine and white.
Agrius—salmon-pink, flaked with vermilion.
Amyntas—white, flaked with rose.
Appianus—white, blotched rose.
Aurora—scarlet, lower petals yellow.
Ball of Fire—scarlet-crimson, very brilliant.
Beauty of England—white, yellow-blotched.
Calliphon — rose, streaked with cerise.
Capio—scarlet, flaked white.
Colonel Colbert — maroon, flaked violet.
Countess of Pembroke—purple, amaranth centre.
Damia—white, tinged lilac.
Dr. Woodford — salmon, flaked with carmine.
Duke of Connaught — salmon-pink, mottled dark crimson.
Duni—crimson, striped with purple.
Egyptian King, deep crimson-maroon.
Galopin—rosy-lilac, purple-blotched.
Helenor — salmon, veined crimson.
Hemon—pale yellow, flaked red.
Heroes—salmon-rose, white-blotched.
John Laing—rose, crimson-blotched.
Julia—pink, feathered carmine.
Lady Bridport—blush-white flaked carmine.
Lord Burleigh — salmon, veined with crimson.
Lord Derby—crimson, violet-striped.
Lord Leigh— crimson, flaked with maroon.
Marcianus—bright orange-red, flushed with purple.
Marica—white, shaded lilac.
Maroon—deep scarlet, flaked crimson.
Meleager—white, flaked rose.
Melitus—white, and purple flaked.
Metroceles—white, flaked violet.
Mr. Baines — orange-crimson.
Mr. Derry—amaranth, flaked purple.
Mrs. Dobree—white, tinged yellow, striped violet.
Mrs. Reynolds Hole—white, lilac-tinged.
Panthoides — pale salmon, tinged purple.
Paterculus — orange flushed cerise.
Perigone — scarlet-crimson, and violet stripe.
Phaleris—white, edged purple.
Pilumnus — white, tinged purple.
Pollis—purple, white centre.
Pulcheria — scarlet, white centre.
Queen Mary—white, tipped with lavender.
Rhamnes — scarlet-crimson, striped with purple.
Semele—white, flaked with rose.
Sir Trevor Lawrence—orange-scarlet.
Thyreus—rosy-salmon, carmine veins.

The Brenchley Gladiolus.—This popular plant is the brilliant red sort that may be seen in gardens during August. It succeeds best in a deep, rich, sandy loam, enriched with good manure, but it does not fail in any ordinary garden soil, provided it be drained and rich, and in an open position. Bulbs are usually on sale during winter, and should be planted during March and April, and if successive plantings are made at intervals of a fortnight the plants will flower in succession. The mode of planting is the same as that recommended for the *Gandavensis* race, but as the spikes are not so massive they do not generally require to be so carefully supported as the *Gandavensis* sorts. The bulbs may be lifted any time during October, the later the better, so as to give them full time to ripen. They should be dried gradually, and wintered in a dry, cool place in dry earth or sand. In some mild localities the bulbs are left in the ground throughout the winter, but as a general rule it is best to lift them.

The Lemoinei race promises to become as important as the other groups. It was originated a few years ago by M. Lemoine, of Nancy, who intercrossed a species from Natal, *G. purpureo-auratus*, with some of the garden hybrids. *G.*

purpureo-auratus itself is not a very attractive species, the flowers being rather small, curiously hooded in shape, and coloured with yellow and blackish-purple hues. It is almost, if not quite, hardy in this climate, and is a strong grower and free flowerer, and very productive of offsets. In the *Lemoinei* race we have a greater diversity of tints than exist even in the *Gandavensis* group, and the way the brilliant tints are combined in the flowers of the same variety is marvellous. The same treatment as the *Gandavensis* section suits this new race, and owing to their stoloniferous habit of growth (a characteristic of *G. purpureo-auratus*) they can be readily propagated, and dozens of bulblets may be taken from a parent bulb in one season. The following list comprises a few of the most noteworthy kinds of the *Lemoinei* family:—Lemoinei, and Marie Lemoine, two of the original seedlings, and both very beautiful sorts, still unsurpassed in their respective colours by newer kinds; Alsace, Lafayette, André Chenier, Emile Lemoine, Ferdinand de Lesseps, Mars, Amiral Pierre, Guerrier de Dumast, Enfant de Nancy, Président Grévy, La France, Gambetta, and Enfant de Lorraine.

Griffinia.—Important garden plants, bearing large, showy flower-heads during autumn and spring. All are tropical plants, hence they require the temperature of a stove, and being evergreen they do not need a dry rest at any period of growth. They are easy to grow if treated like Eucharis.

G. Blumenavia—flowers a pure white, and heavily pencilled with carmine, borne in autumn or spring.
G. hyacinthina has large and dense clusters of flowers, of a bluish-lilac tint. In the variety maxima, they are three or four inches across, and white; in minor or parviflora, they are smaller; generally flowers throughout the autumn months.
G. ornata—produces during the winter months large clusters of delicate bluish-lilac flowers, which fade to nearly white.

Habranthus pratensis.—A Chilian bulb, producing flower-stems about a foot in height, carrying from two to four large, showy flowers of a bright orange-red, intensely brilliant in the variety *fulgens*, which is by far the most desirable plant to cultivate. It is of easy cultivation in pots in a frame or greenhouse, but the most satisfactory way to grow it is to plant the bulbs out in a well-drained border of light and rather rich loamy soil at the foot of a sunny south wall. It flowers in May or June. In winter cover the bulbs with ashes, or other protective material. Other species in cultivation are *H. Andersoni*, with yellowish-red flowers; *H. Bagnoldi*, flowers yellow and pale red; *H. hesperius*, flowers red and yellow—all South American plants of about the same degree of hardiness as *H. pratensis*, flowering about the same season, and requiring similar treatment.

Hæmanthus (*Blood Lilies*).—These are among the showiest of green-house and stove bulbs, possessing for the most part brilliantly-coloured flowers. Their flowers are borne in dense clusters, and the stamens protrude considerably from the heads of the flowers, so as to give them a brush-like appearance, the prevalent colours being reds and scarlets. The species, numbering about a score, divide themselves naturally into two groups. In one the leaves are large, of thin texture, and generally wavy at the margins. The bulbs, also, of the species in this group are characterised by combining a large proportion of the stems. The species of this group, moreover, separate themselves into two sets, one having erect petals to the flowers, as in *H. multiflorus*, while in others the petals are spreading, as in *H. puniceus* and *H. Natalensis*. In the second section the bulbs are more compressed, and the leaves, which though large are of fleshy texture, are generally arranged opposite each other, as in the well-known *H. coccineus*. The species in this group are also classed into two sets, one having spreading petals, the other erect.

The Blood Lilies are all natives of Africa, the greater number of the three-dozen-odd species known to botanists being found at the Cape, and these are suitable for green-house culture. The rest inhabit more tropical parts, and therefore require stove culture, and as they are easily grown, and for the most part easily obtainable, they constitute a rather important family of bulbs. The following list comprises the most noteworthy kinds among those in cultivation, several of which have been in gardens for generations:—

Green-house Species (Natives of South Africa).

H. albiflos—one of the smallest growers. Leaves short and fleshy; flowers white, produced in dense clusters on short stems.
H. carneus—somewhat like the last, but with rose-tinted flower-heads.
H. coccineus—one of the oldest of Cape bulbous plants, commonly called Cape Tulip. Leaves large and fleshy, spreading horizontally; flower-heads dense bright scarlet. Various forms of this species are in gardens, one of the best known being carinatus.
H. moschatus—not a showy but a desirable plant, on account of its delicately perfumed flowers. The flower-heads are pale pink, produced before the leaves.
H. Natalensis—a beautiful species, having ample leaves, and large dense clusters of flowers, accompanied by very rich crimson-purple bracts; the flowers themselves are pale, with yellow-tipped anthers. Flowers in February.
H. pubescens—a very old and well-known species, not so desirable as others. It has white flower-heads, and large leaves, covered with soft, whitish hairs.
H. puniceus—one of the finest of the genus, and has long been a favourite cultivated plant, having been grown so long ago as 1722. The flower-heads are large and dense, and of a brilliant scarlet, produced in early summer, but may be forced into flower earlier. One of the easiest of all to grow and flower well.

Stove Species (Natives of Tropical Africa).

H. cinnabarinus — a brilliantly-flowered species, producing large spreading heads of glowing scarlet-red flowers about August. The flowers are produced with the leaves, which are large, sheathing at the base; the bulb has a long neck. Western Africa.

H. Kalbreyeri — this new species from the coast of Guinea is unsurpassed in the genus. It belongs to the large and thin-leaved group, and its flower clusters are often produced a foot across, and of a splendid scarlet-crimson. It lasts in flower a long time, and as it flowers in winter and spring as well as in summer, it is most valuable.

H. Katharinæ—a new species similar to the last, and likewise extremely attractive. H. Manni, another new species, is a near ally of Katharinæ, but is rare.

H. multiflorus—a tropical species from Sierra Leone. The flower-heads, produced about midsummer, are large, spreading, and of a deep red; the leaves are large and pale green. Among other species belonging to the stove group is Abyssinicus (also known as tenuifolius), and this and the rest of the group are invaluable ornamental plants.

Other species belonging to the green-house section include *quadrivalvis*, *insignis*, *sanguineus*, *lancifolius* (*albo-maculatus*, having the leaves spotted with white), *virescens*, *Rouperi*, and *magnificus*, all of which are showy plants, but more or less rare.

Culture.—The South African species may all be considered green-house plants, while those from tropical Africa require stove treatment. All are of simple culture. Being very strong growers they require generous treatment, such as a good sandy loamy soil affords, with the addition of a little manure for the most vigorous. When in active growth the plants cannot suffer from an over-abundance of water, and all are benefited in the growing season by an occasional dose of weak liquid manure. Full exposure to sunlight is necessary, and when the foliage shows signs of decay, water should be gradually withheld until the soil is perfectly dry at the resting period. The Cape species will be benefited by a protracted season of dryness when the bulbs are leafless, but the tropical kinds do not require such a long dry rest as those from the Cape. Hæmanthuses succeed best when pot-bound with roots, and these often grow so strong as to break the pots.

Hesperoscordum lacteum is an elegant Californian Lilywort, very hardy, and of simple culture. It bears clusters of starry, milk-white flowers. In the variety *lilacinum* the colour is lilac. It thrives in any light, warm soil. Called also *H. hyacinthinum*, *Milla lactea*, and *Brodiæa lactea*.

Hippeastrum. (See *Amaryllis*.)

Homeria.—A small genus of the Iris family, native of the Cape of Good Hope. The species are similar to Ixias, their flowers varying from yellow to orange-red, but being very fugitive are not of much value as garden plants. Of the few species known, the best known in gardens are *H. elegans*, *H. collina* (with its varieties *ochroleuca* and *miniata*), and *H. aurantiaca*, the latter having bright orange-red flowers. They require the same treatment as Ixias and other Cape bulbs.

Hyacinthus. — Though the Hyacinth is an Eastern plant, originally brought from a much warmer climate than ours, it has, after having been in cultivation for centuries, quite adapted itself to our climate, and thrives perfectly in the open air. But it is chiefly as a forced pot-plant that it is so popular, and so long has it been thus treated that forcing has become to it a second nature, as it were.

The culture of Hyacinths may be divided into two heads, indoor and outdoor treatment, and both are simple, provided a few conditions are observed. First of all, the bulbs should be procured early in September. In choosing Hyacinths see that they are sound and heavy, as the weightiest bulbs invariably produce the best spikes. There should be no delay in potting the bulbs, as nothing so much weakens bulbs as keeping them in bags for any great length of time. It is best to pot the whole of the bulbs at one time, and place the pots in the open air, or under a frame, which, however, should not be heated. A layer of about six inches in depth of coal-ashes, cocoa-nut fibre refuse, or similar material, should be placed on and around the pots so as to retard leaf-growth until the roots have got a fair start. The bulbs should be left covered with the ashes for a period ranging from four to ten weeks, during which time roots will be formed, and then the bulbs are safe to introduce into a warm house, so as to induce the flower-spikes to develop. The bulbs should be taken first to a green-house intermediate in temperature between the outside and forcing-house temperature, and after remaining there a week or so, may safely be taken to the warmer house. The first batch of bulbs should be introduced into heat about the latter part of October if early bloom is desired, and if a large number of bulbs are grown the last batch would not be put into the forcing-house before February, at which period the spikes would develop more quickly, and be much better; in fact, the later the Hyacinth flowers the better will be the spike. From the time of potting until the crowns of the bulbs commence to push up no water should be given, but when they are in active growth they must be watered freely, as the Hyacinth loves water. During the whole process of forcing attention must be paid to ventilation, otherwise drawn foliage and weakly spikes will be the result of an ill-ventilated house.

The best soil for Hyacinths is one composed of two parts of good turfy loam, one of well-decayed

cow-manure, one of leaf-mould, and one of sand. Ample drainage must be given, as Hyacinths like plenty of water if it percolates freely. The crown or top of the bulb should be placed on a level with the surface of the soil, which latter should be pressed firmly. It is a good plan to put a little sand both beneath the bulb and around it in potting. The Hyacinth being a deep rooter, special Hyacinth pots, which are considerably deeper than the ordinary kind, are often used, but these are unnecessary, as the finest Hyacinths possible to produce are grown in common six-inch pots. Forced Hyacinths are often grown in suspended baskets, wire or wood, in damp moss, in boxes, in rustic cork, and a variety of other ways, but for the production of good flower-spikes pot culture is superior to all other modes.

Glass culture of Hyacinths in rooms is now commonly practised, and as the bulbs may be bought so cheaply the humblest cottage window may be adorned in spring with Hyacinths as fine often as can be grown in pots. The glasses best for the purpose are such as are semi-transparent, or even opaque, as the roots do not like the light. Choose sound bulbs, and in order to be successful the bulbs must be induced to develop roots *before* the crowns commence to swell. Therefore, the usual plan is to put the bulbs in glasses filled with water (but the bases must not touch the water), and place them in a *cool*, dark place. This so retards top-growth, and conduces to root-growth, that by the time the crowns swell there will be roots to carry on the work of nourishing the unfolding leaves and spikes. After roots have formed, and the crown starts, the bulbs should have all the light possible, and the lightest window is not too open for it. Some put paper caps over the crowns to keep them from the light until the roots grow, and various devices will suggest themselves to any one bent upon having good glass Hyacinths. While it is necessary that the bulb should be clear of the water itself, it may be occasionally watered, and left to dry itself. The best water to use is filtered soft water, but any kind of water really will do, although the roots do not flourish so well in cold spring-water as in rain-water. The latter is apt to become putrid so quickly that its use is objectionable, but filtering obviates this to some extent. Boiling takes away the harshness of spring or other hard water, and some put a piece of charcoal in each glass to preserve it in a fresh condition. As regards changing the water, the rule is to change it as soon as it becomes turbid or discoloured, which period will vary. At intervals of a week or so, it is advisable to well rinse the roots by repeatedly pouring in water and emptying the glasses.

The *open-air culture* of Hyacinths is simple enough. If grown in beds on lawns by themselves, the bulbs should be planted during dry weather in October or November. The ground must be deep and open, and well drained and manured. The bulbs may be planted at distances from eight to twelve inches apart, and from four to six inches in depth. A layer of sharp sand should be put beneath and around the bulbs, and after all are planted the beds may be protected from severe frosts by a mulching of cocoa-nut fibre, tan, or decayed manure, and at the time the bulbs are in flower some go as far as erecting an awning over each bed in order to protect the spikes. The arrangement of the colours of the different varieties may be done according to the fancy of the planter, always remembering that masses of colour produce a finer effect on lawns, or elsewhere, than mixtures of various colours with no decided mass. The spikes must have some kind of support, and if attended to in this, and other respects, will produce bright effects in the garden for several weeks during April and May.

Selection of Sorts.—Seeing that the named sorts of Hyacinths are some hundreds, and as every seedsman's catalogue embraces a descriptive list of those usually grown, there is only need here to enumerate a few of the very best single and double sorts suitable for a moderate-sized garden, or for exhibition. Single-flowered sorts should always be preferred to double, as they yield the best spikes, and have a more pleasing appearance. Commencing with single blue sorts, the best are Baron Van Tuyll, King of the Blues, Argus, Charles Dickens, Blondin, Czar Peter, De Candolle, Grand Lilas, Grand Maitre, General Havelock, Lord Derby, Marie, Mimosa, Prince of Wales, Sir John Lawrence, and Lord Palmerston. Among the best double blues are Van Speyk, pale; and Laurens Koster, dark. A selection of single reds and pinks would consist of Garibaldi, Cavaignac, Fabiola, Sultan's Favourite, Von Schiller, Lord Macaulay, Linnæus, Vurbaak, Gigantea, Lina, and Princess Helena. Duke of Wellington and Koh-i-noor are two of the best double reds. Among magenta and mauve-tinted sorts are Haydn, Sir Henry Havelock, and Charles Dickens. White sorts are numerous, and among the finest singles are La Grandesse, Alba maxima, Mont Blanc, L'Innocence, Queen of the Netherlands, Snowball, Grandeur à Merveille, and Baroness Van Tuyll. The yellow sorts are as yet few in number, the best being Ida and Bird of Paradise.

Roman and Italian Hyacinths differ from the ordinary Dutch varieties in being altogether smaller, and less dense in the spike. The Roman variety is valuable on account of its early flowering, and it is largely grown for providing bloom during the winter months, and as early as November its

sweet-scented spikes of pure white blossoms may be obtained. Roman Hyacinths should be bought and potted either in August or September. August-potted bulbs will flower during November, and those potted later would carry on a succession till Christmas, when the earliest Dutch varieties may be had in bloom. There are the white and the blue Roman Hyacinth, the white being the sort chiefly grown. The Italian Hyacinth, like the Roman, is almost identical with the wild form of *H. orientalis*, from which have sprung the Dutch and other races. The Italian is not as early as the Roman, but is as valuable, and particularly the double white variety, which may be had in bloom by Christmas time, when it is invaluable. For soil, mode of potting, and after-treatment, see culture of the Dutch sorts.

The propagation of Hyacinths is so seldom if ever practised in this country, that there is no need to describe the various methods followed by the bulb-growers in Holland, where bulb-culture is a national industry. They raise new sorts from seed, and particular sorts are propagated largely by offsets and bulblets obtained by division of the parent bulbs, some being more productive of offsets than others.

Hyacinthus amethystinus is a charming little hardy bulb, in the way of the common Wood Hyacinth (*Scilla nutans*). It flowers with the late Scillas about April, and flourishes in any light warm soil. The white variety of it is much prized. What are commonly called Grape Hyacinths, Feathered Hyacinths, and Musk Hyacinths, all belong to the genus *Muscari*, and *H. candicans* is described under its correct name, *Galtonia*.

Hymenocallis.—The *Hymenocallis* and *Pancratium* so nearly resemble each other, that it is a difficult matter to distinguish the difference between the two genera, hence they have become somewhat confused in gardens. The species of both genera are natives of tropical and sub-tropical America; most of the species of both have large evergreen foliage, and the form of the flowers is much the same, and invariably white.

The following include the most desirable species:

H. adnata—leaves narrow; flowers snow-white. Acutifolia is similar, but has narrower leaves.

H. Caribbæa—a lovely West Indian plant, having fragrant flowers. Requires a strong moist heat for its successful growth.

H. fragrans has deliciously perfumed flowers of the purest white, and evergreen leaves. It is suitable for warm green-house culture. H. amœna and H. ovata may be classed with fragrans, as they are similar, and require the same treatment.

H. macrostephana — the finest of the genus produces huge heads of from six to a dozen white and fragrant flowers. It is evergreen, and is easily grown in a warm and moist stove. H. Regina is a similar plant.

H. Mexicana, also called H. littoralis, is a good kind for the green-house. It has evergreen foliage, and flowers freely in a moderate temperature.

H. rotata, from the Southern States of North America, is almost hardy. Being a beautiful plant it is quite worth frame or green-house culture, as it is only in the most favoured places that it will succeed well unprotected. It is of dwarf growth, and produces heads of white flowers.

H. speciosa is a deciduous plant, and therefore needs more attention than the evergreen kinds, and requires a decided rest by being kept drier when the foliage is gone. The flowers are white and fragrant.

Culture.—The tropical *Hymenocallises* require a warm and moist stove, and as they are nearly all evergreen, their treatment is simple, there being no decided resting season—a critical period with most deciduous bulbs. During summer they can scarcely have too much water, but in autumn and during winter they should be kept comparatively dry until the spring. They have no definite flowering season; sometimes they bloom in the depth of winter, when their flowers are most valued, but they flower most plentifully about early summer. All the species like a good loamy soil; as most of them are gross feeders, a portion of decayed manure may be added with advantage to the compost. They are impatient of being over-potted; indeed, they thrive best when the pots are crammed with roots, provided they are stimulated with liquid manure now and then. They are easily increased by offsets, separated at potting time in early spring. The bulblets may be treated the same as the large plants. Seedlings may also be raised in the same manner as other stove bulbs. The green-house and half-hardy species require the same general treatment.

Iris (*Bulbous*).—See *Xiphion*.

Ismene.—There are about half a dozen species of *Ismene* known, all natives of tropical and temperate America. All are deciduous, producing erect flower-stems carrying heads of large flowers, similar to those of *Pancratium* and *Hymenocallis*.

Culture.—The *Ismenes* can be grown in the stove, green-house, or even the open air, the chief condition to observe being the thorough ripening of the bulbs, and perfect rest when leafless. Keep them dry and cool when at rest, but water plentifully when in active growth. The bulbs are usually obtainable in a dry state from nurseries during the autumn months, and should be potted at once, and kept dry till spring, or placed in sand during winter; in either case perfect dryness is essential.

The following are the principal species in gardens:

I. Amancaes (the Peruvian Daffodil) has large yellow and fragrant flowers, borne in clusters on tall stems, with a funnel-like crown. It often flowers twice in a year—summer and late autumn. It may either be grown in a stove or greenhouse. The va-

riety sulphurea has paler flowers, and is supposed to be a cross between Amancaes and I. calathina. Native of Peru.

I. Andreana—a beautiful new species; bears clusters of large white flowers, having cups fully three inches across. It flowers in summer, and sometimes during autumn and winter. It requires a stove or a warm greenhouse. I. tenuifolia is a similar species, also new, and at present rare in gardens.

I. calathina (the Sea Daffodil) is similar to Andreana, the large, fragrant, white flowers being borne in umbels of three or four blooms, produced in May and June. Being found in Chili and Buenos Ayres, it is hardier than the rest, and may be grown in the open air in some parts of this country. Dean Herbert used to plant bulbs in deep holes in a sandy border in April, putting white sand around the bulbs when planting. The most satisfactory results, however, may be obtained by growing it in large deep pots in a cool greenhouse. It is such a beautiful and fragrant plant, that it well deserves any attention that may be bestowed upon it. Less common kinds are I. nutans, I. virescens, I. pedunculata, and I. Macleana.

Ixia.—Although there is now such a great variety in the *Ixias*, there are only about twenty distinct species. These have become so intercrossed by hybridising that only a few now remain unaltered, such as *I. crateroides*, and *viridiflora*, the colour of the latter being a sort of sea-green. The species may be classed in two groups, the first comprising those with flowers having a dark blotch on the base of each petal; the second, those whose flowers are spotless. Among the principal species are the following:—*I. aristata*, deep rose-pink, pale centre; *anemonæflora*, of variable colour; *crateroides*, or *speciosa*, beautiful deep rose-pink; *curta*, red, with purple centre; *columellaris*, bright red, crimson centre; *fucata*, white or yellowish; *flexuosa*, flowers small, and variable in colour; *hybrida*, white, purple centre. These may be called the types from which the numerous varieties now enumerated in seedsmen's catalogues have been derived. The following selection includes the principal varieties:—

Alliance—deep crimson.
Amelia—pink and orange.
Aurantiaca major—yellow.
Aurora—bright pink.
Beauty of Norfolk—pale yellow, flushed magenta.
Brutus—maroon-crimson.
Cleopatra—white, pink eye.
Conqueror—rose-pink, dark centre.
Crateroides—brilliant rose.
Delicata—pale yellow.
Diana—white and purple.
Eveline—white and magenta.
Faunas—orange-yellow.
Garibaldi—rose and purple.
Golden Drop—deep yellow.
Hector—rose, black centre.
Ida—orange and crimson.
Magnifica—yellow and rose.
Nosegay—white and rose.
Prestios—white and crimson.
Silas—yellow and crimson.
Sunbeam—yellow, tipped red.
Theseus—white, shaded crimson.
Viridiflora—sea-green, dark centre.
Vulcan—crimson.
Wonder—rose-pink.

Culture.—*Ixias* may be grown either in open beds in warm, sheltered spots, or in frames; a light, sandy, and well-drained soil, and an open sunny situation, are what they require. The chief attention required is protecting the tender growth in spring from late frosts and drying winds. When planted in open beds protected during the winter by wooden shutters, until the foliage is above ground, protection in early spring may be afforded by a few evergreen boughs of trees such as the Spruce. The bulbs may be bought in September, and should be planted at once. They are easily propagated by offsets and seeds, but increasing the stock of such bulbs as these is not profitable, seeing that they may be purchased at such a cheap rate—from two shillings to five shillings per dozen, and mixed unnamed sorts as low as five shillings per hundred. *Ixias* may also be grown in pots for green-house decoration, and under this treatment they may be gently forced into flower earlier than the bulbs planted in frames.

TREES AND SHRUBS.

By George Nicholson.

Jasminum.—Several of the hardy Jessamines—by far the larger proportion of the 120 species of the genus are stove or green-house plants—are amongst the prettiest of trailers. *J. floridum*, or, as it is sometimes called, *J. subulatum*, has pinnately trifoliolate leaves, and lax cymes of yellow flowers, with long calyx teeth; a native of China. *J. fruticans* is a small-leaved, hardy evergreen from Southern Europe, attaining, under favourable conditions, a height of ten or twelve feet, and making a dense bush in the ordinary shrubbery border. *J. humile*, another South European species, is nearly allied to the last-named, but is of smaller stature and humbler growth. *J. nudiflorum*, a plant introduced from China some forty years ago, is now widely cultivated, and is with justice looked upon as one of the best of deciduous trailers for winter and spring flowering. If planted amongst Ivy, or some other evergreen, such as Yew, &c., its long, flexible branches, clothed throughout their length with large yellow flowers, are much more beautiful with their setting, or background, of green. *J. officinale*, the only really hardy white-flowered Jessamine, has several garden varieties, including variegated and double ones—the best of all is *J. o. affine*, which has a more copious inflorescence and larger flowers than the type, which, in a wild state, is found from Northern India to Persia, but is now naturalised in the South of Europe, &c. *J. revolutum* has compound, terminal corymbs of large, bright yellow flowers, produced throughout the summer and autumn months. A native of India.

Juglans (*Walnuts*).—There are only about half a

dozen species belonging to the genus *Juglans*, and of these three are North American, the rest from Asia. Perhaps the most important of all is the common Walnut, *J Regia*, of which there are very numerous varieties, differing widely in the foliage characters as well as in the size and shape of the fruit, the thickness of the shell, &c. *J. r. laciniata* is one of the most distinct of those with ornamental leaves, the leaflets being deeply and irregularly cut; this fruits very freely, and in some places is cultivated for the nuts. *J. r. monophylla* is more curious and interesting than beautiful; as a rule the lateral leaflets are suppressed, and the leaf consists of the terminal leaflet only. *J. r. elongata* furnishes the very large, long nuts, which are so popular in Covent Garden Market. *J. nigra*, the Black Walnut of the Eastern United States, is a brown-barked, large, handsome tree, with valuable purplish-brown wood, turning blackish with age; *J. cinerea*, the Butternut, from the same botanical region as the last, is a tree from thirty to fifty feet high, with greyish bark and widely spreading branches. Both are quite hardy in this country.

Kalmia.—Amongst free-flowering hardy shrubs there are few subjects more beautiful when in flower than the species of *Kalmia*, or American Laurel, described below. They thrive thoroughly in a damp peat border, and are readily raised from seeds, which are ripened freely in this country. There are only some half-dozen species altogether, all natives of North America. *K. angustifolia* has flowers more crimson in colour, and about two-thirds less than those of the Mountain Laurel, or Calico-bush, *K. latifolia;* it is a shrub two or three feet in height, with narrowly-oblong stalked leaves, light green above and whitish beneath, and many-flowered lateral corymbs, opening in May and June. *K. glauca* has nearly sessile, oblong leaves, white-glaucous beneath, with revolute margins; the shrub only grows about a foot high, and has terminal corymbs of lilac-purple flowers. *K. hirsuta* has bristly hairy leaves and branches, and scattered rose-coloured flowers, solitary in the axils of the leaves of the season. *K. latifolia* has stalked, ovate-lanceolate or elliptical leaves (bright green on both sides) tapering to each end, and terminal corymbs of viscid, pubescent flowers, varying in colour from deep rose to nearly white; the variety known in nurseries as *K. myrtifolia* is a very floriferous, pale-flowered form of dwarf, compact habit, and with leaves much narrower than those of the type, which is the tallest and most robust of the genus.

Kerria.—Of this genus of *Rosaceæ*, there are only a couple of species, one of which, *K. Japonica*, is frequently met with in old-fashioned gardens. The double-flowered form is the most common, and is at home either as a bush in the shrubbery, or trained against a wall; in both positions it flowers freely. The variegated form is a weaker grower, with single flowers, and smaller leaves, margined broadly and blotched with creamy-white; this requires a sheltered place—planted out in the cool conservatory it makes a most attractive object. The single state of the ordinary type is a graceful shrub with apparently a more prolonged flowering season than the double plant. These plants have long been cultivated by the Chinese and Japanese. They grow freely in this country under varied conditions as regards soil, and are easily increased by cuttings.

Kœlreuteria paniculata is the only species of this genus of *Sapindaceæ*. It is a native of Northern China, and is a handsome, small, deciduous tree, producing a profusion of yellow flowers, in large terminal panicles, in June and July; these are followed in the Southern counties by large, inflated, reddish seed-vessels, which are very conspicuous. The leaves are unequally pinnate, with deeply-toothed leaflets; in autumn they assume a deep yellow colour.

Laburnum.—All the Laburnums—there are only three species—are wonderfully beautiful, and two of them are amongst the most popular of flowering trees, or shrubs. The third is yet rare, and in any case will never be so widely grown as either *L. alpinum* or *L. vulgare*. The former is readily distinguished from the latter by the distinctly-winged upper suture of the seed-pod; in *L. vulgare* the hairy pod has its upper suture thickened and keeled, but not winged. There are many varieties of these two species, some of which it is difficult to assign to their proper places without seeing the seed-pods. As a rule, though, the golden racemes of *L. alpinum*, the so-called Scotch Laburnum, are longer than those of *L. vulgare*. *Fragrans*, *hirsutum*, and *pendulum* (a weeping form) are the best of the varieties of *L. alpinum*. Of *L. vulgare* the following are the most distinct and desirable varieties: *aureum* has golden-yellow leaves; *Carlieri* has very narrow leaflets and long racemes; *involutum* has peculiarly curved leaflets; *Parkesii* has very long racemes of darker-coloured flowers than the type; in *quercifolium* the leaflets have sinuated margins not unlike those of an Oak-leaf; *Watereri*, a very free-flowering variety, with large, deep yellow flowers, in very long racemes. The so-called Purple Laburnum, *L. Adami*, is supposed to have been a graft-hybrid between *L. vulgare* and *Cytisus purpureus;* old trees frequently produce three distinct types of flower—

viz., exactly those of the common Laburnum; others similar in size, but of a dull purplish colour; and, again, others quite like those of *Cytisus purpureus*. Laburnums thrive in almost any soil or situation, and are readily raised from seeds. Any of the above varieties, or others which it is thought desirable to propagate, must be budded on seedling stocks.

Laurus (*Bay*).—This genus contains but a couple of species; one being a native of the Canary Islands; and the one here mentioned, *L. nobilis* (the Sweet Bay, the *Laurel* of ancient poetry), of the Mediterranean region. Of this fragrant, aromatic evergreen, there are several varieties varying somewhat in the form of the leaves; *angustifolia*, *crispa*, *salicifolia*, and *variegata* have names which sufficiently indicate their peculiar characteristics. The plant formerly known as *L. Benzoin*, the Spice-bush of the Northern United States, is now placed in the genus *Lindera* under the name of *Lindera Benzoin*. *Laurus Sassafras*, the Sassafras of the same botanical region as the Spice-bush, is also removed from the genus *Laurus;* its proper name is now *Sassafras officinale*.

Ledum.—There are only some four or five species in this genus, which is confined to the cold regions of the northern hemisphere. All are pretty, low-growing, evergreen shrubs, and require a damp peat border for their successful cultivation. *L. latifolium* has oblong or elliptical leaves, clothed with rusty wool beneath, and terminal umbel-like clusters of white flowers; this is a native of North America. *L. palustre*, the Labrador Tea—so called on account of its leaves being used as a substitute for tea—is common in the cold swampy bogs of Northern Europe, Asia, and British North America; it is readily distinguished from *L. latifolium* by its dwarfish habit (about two feet high, whereas *L. latifolium* attains as great a height as five feet), narrower leaves, and in having ten stamens instead of five.

Leiophyllum buxifolium—the Sand-Myrtle of New Jersey—is a charming dwarf-growing evergreen, with small glossy Box-like leaves, and white or pink-tinted flowers, in terminal umbel-like clusters. It hardly attains a foot in height, and seems to thrive best in a sandy peat border; it is perfectly hardy and very floriferous. In many nursery catalogues this species will be found under its old, but incorrect, name of *Ledum buxifolium*.

Lespedeza.—By far the most desirable garden plant of all the twenty-five species of this rather showy genus is *L. bicolor*, perhaps better known in gardens under the name of *Desmodium penduliflorum;* this grows to a height of six feet or more, and produces a profusion of rosy-purple, Pea-shaped flowers, in long, terminal, branched panicles. There is also a totally different plant cultivated in gardens under the name of *L. bicolor*, but it is hardly worthy of being described here. The true plant is a native of North China and Japan, and a comparatively recent introduction to British gardens; it is quite hardy.

Leucothoe.—About eight species of *Leucothoe* are known to botanists, and all of them are well worth a place in the peat border. Provided lime is absent, *L. axillaris* and *L. Catesbæi* will thrive in ordinary loam, but all seem to grow more freely in a peaty soil. *L. axillaris* has spinosely-serrated, shortly-stalked, oblong or oval, evergreen leaves, and axillary racemes of white flowers, opening in May. *L. Catesbæi* has conspicuously stalked evergreen leaves, the margins of which are serrulate, with spinulose appressed teeth, and long racemes of white flowers exhaling the somewhat unpleasant odour of Chestnut blossoms. Both are natives of the Northern United States; have long, spreading, or recurved branches, and grow from two to four feet high; they make dense masses, and are fine objects when planted along water-courses, or in damp woods, where they make a good cover for game.

Leycesteria formosa—a handsome, deciduous Himalayan shrub—grows freely under tall trees, and bears an abundance of white, purplish-tinted flowers, followed by deep purple berries, of which pheasants are said to be fond. It grows four to six feet high, and is well worth a place in any shrubbery border.

Ligustrum (*Privets*).—This genus contains about twenty-five species of ornamental, deciduous, or evergreen trees or shrubs, natives of Europe, temperate and tropical Asia, and Australia. Several of them are amongst the most useful shrubs we have—viz., *L. ovalifolium* and *L. vulgare*, which are such good hedge plants; *L. Japonicum* and *L. lucidum* are handsome subjects, best seen when grown as single specimens, and allowed to develop to their fullest extent. All are readily raised from cuttings planted in sandy soil in August or September, in the open air; the choice variegated forms (of the leathery-leaved evergreen species especially) are generally grafted in pots under glass, and afterwards hardened off for outdoor decoration. *L. Ibota* is a pretty Japanese slender-twigged shrub, with a spike-like inflorescence; it is cultivated in its native country principally as a food-plant for a wax-producing insect. *L. Japonicum* is a beautiful evergreen with dark, glossy, leathery leaves; there are two or three different variegated forms of this species. *L. lucidum*, a Chinese plant, sometimes in the South

of England, at any rate, attains the size of a small tree, and is most effective with its large much-spreading panicles of white flowers. Like the last-named it is a large-leaved evergreen species. *L. Massalongianum* has long narrow leaves, and much-branched dense panicles; for a long time the native country of this very distinct plant was not known, but of late it has been ascertained to be the Khasya Hills. In gardens, and gardening literature, a number of names have been given to *L. Massalongianum*—some of these are *L. angustifolium*, *L. myrtifolium*, *L. rosmarinifolium*. Perhaps the most generally known of all the Privets is *L. ovalifolium*, which has larger and more persistent foliage than the common *L. vulgare*, and makes equally as good a hedge; it is very hardy, and flowers profusely if not cut in; it is a native of Japan, and there are several beautiful variegated forms in cultivation. *L. Quihoui*, a Chinese species, is very distinct by reason of its purplish, hairy, wiry branches, its dark green, oblong or oblong-ovate leaves, and its large, loose, terminal panicles. *L. Sinense*, when allowed to grow to its full size, makes one of the best of summer-flowering shrubs; its racemes, or panicles, are produced in such profusion as to give a good specimen the appearance of being covered with a white sheet. *L. vulgare* has a number of varieties: white and yellow-berried, gold and silver-leaved, and a weeping form.

Liquidambar.—Nearly a half-dozen species of *Liquidambar* are known, one from North America, one from the Levant, and the rest from China. The only member of the genus worthy of special mention from a purely garden standpoint is *L. styraciflua*, the Sweet Gum-tree of the Northern United States, a large and handsome tree, with long-stalked, deeply five to seven-lobed, glossy leaves, which are fragrant when bruised—in favourable seasons they turn a deep crimson colour before falling, and a good tree makes a splendid object in the park or pleasure-ground; in dull sunless seasons only various shades of purple and bronze occur. The branchlets are clothed with grey bark, and are generally covered with corky ridges. *L. styraciflua* grows best in a deep damp loam, and should be more frequently grown than it is at present.

Liriodendron tulipifera (the *Tulip-tree*) is, without doubt, one of the most beautiful of hardy exotic trees. In its native habitats—the Eastern United States—it forms a large tree from seventy to 100 feet in height, with a trunk four to seven feet in diameter, and is, in fact, one of the largest and most valuable trees of the Atlantic forests. In Britain specimens of considerable size exist, and they are found to thrive under very varied conditions as regards soil. The remarkable leaves, which alone are sufficient to distinguish the Tulip-tree from any other in cultivation, are very smooth, with two lateral lobes near the base, and two at the apex, which appears as if cut off abruptly by a broad shallow notch. The sweet-scented flowers, which are very freely produced by old trees, are greenish-yellow without, and orange within. In autumn the decaying foliage assumes a rich golden-yellow or brown tint. Several forms are in cultivation, the most desirable being *pyramidalis*, a variety resembling in habit the Lombardy Poplar; and *variegata*, another with golden variegated leaves.

Lonicera.—All the species of this genus, and about eighty have been described—are natives of the northern hemisphere, most of them from the temperate regions. A number of the introduced species are not particularly ornamental; only those which are really desirable are mentioned here. For convenience of reference, and to avoid repetition, the climbers, or twiners, of which our native Honeysuckle, *L. Periclymenum*, may be taken as a type, are mentioned under one heading, and the bushes (the non-climbing or non-twining ones) under another.

Twining Species.

L. Caprifolium, a South European species, naturalised here and there in some of the English counties, has very fragrant yellowish flowers, nearly like those of the common truly native *L. Periclymenum*, but differs from that plant in having a sessile flower-head, and in the upper leaves being connate. *L. Etrusca*, another South European species, has orange-yellow flowers, and stalked flower-heads. *L. flava*, the Yellow Honeysuckle of the Northern United States, has smooth, thickish, obovate or oval leaves, pale and glaucous on both sides, and light yellow fragrant flowers. *L. flexuosa* is a Japanese species, with hairy stems, and ovate-lanceolate leaves, hairy, and with a purplish tinge when young; the very fragrant flowers are borne in pairs, and are pink and yellow in colour. *L. Japonica*, one of the most beautiful of all hardy twiners, has fragrant flowers opening a creamy-yellow, and fading to almost golden-yellow; it is a very free grower and flowerer. *L. sempervirens*, the Scarlet Trumpet Honeysuckle, has large clusters of scentless flowers of a beautiful scarlet outside, and yellow inside. *L. Plantieriensis*, a garden hybrid, of which the last-named was one of the parents, has even larger flowers of an orange-scarlet colour.

Erect, Non-twining Species.

L. fragrantissima, a Chinese plant, is one of the earliest of spring-flowering shrubs; the flowers are

small, but deliciously fragrant. *L. Standishii* is a nearly allied but distinct species. Both do well either against a wall, or treated as bushes in the ordinary shrubbery. *L. involucrata*, the correct name of the plant frequently met with under the name of *L. Ledebourii*, is a Californian species, with long glutinous flowers, yellow tinged with red, borne two or three together on axillary stalks. *L. Tatarica* varies a good deal both in habit and in the size and colour of the flower; the peduncles are two-flowered, and the flowers vary from almost pure white to a deep rosy tint; some of the best of the forms make beautiful objects if planted in an open spot in good stiff loamy soil.

Maclura aurantiaca, the only species now retained in the genus *Maclura*, grows to a considerable size in its native country, North America, sometimes attaining a height of fifty or sixty feet, with a trunk two to three feet in diameter. It has a yellow wood, which is very solid, heavy, elastic, and exceedingly durable, and is valuable for constructing railway ties, &c. On account of the branches being armed with stout spines, it is commonly grown in the Western United States—and less frequently in other countries—as a bush for forming hedges. The flowers are inconspicuous, but the large fruit, from three to five inches in diameter, is of a bright golden-yellow. The English name of the tree, "Osage Orange," originated on account of the Orange-like fruits, which, however, are not edible. It is probable that only in the Southern counties of England are fruits ripened, but the tree is hardy enough elsewhere. The plant grown in gardens under the name of *Maclura tricuspidata*, a somewhat recent introduction from China, belongs to a totally different genus, viz., *Cudrania*, and the proper name of the species is *C. triloba;* it is a very interesting deciduous shrub, and of some economic importance in its native country, as it is one of the plants the leaves of which are used by the Chinese for feeding silkworms. Both belong to *Urticaceæ*, the great Nettle order, but the first-named genus is in the section *Moreæ*, of which *Morus* (the Mulberry) is a representative, and the latter in *Artocarpæ*, of which *Artocarpus*—the genus to which the Bread-fruit belongs—is the type.

The Magnolias.—About two-thirds of the number of species comprised in this splendid genus may fairly claim to be classed as hardy in most parts of Britain; those which require special care, or peculiar conditions, are not included here.

M. acuminata (the Cucumber-tree of the Eastern United States) forms, in its native habitats, a large tree sixty to ninety feet high, with a trunk two to four feet in diameter although perhaps this country can boast of no specimens so large, there are trees with fine heads about fifty feet in height, with trunks about one and a half feet in diameter, in the South of England. The oblong pointed, green leaves are from five to ten inches long, and the slightly fragrant, bell-shaped flowers are a glaucous-green colour tinged with yellow. The variety *aurea* is a new form, with golden foliage slightly streaked and mottled with green; *maxima* is another with larger leaves, and is supposed to be a faster grower than the type.

M. conspicua is one of the most beautiful of all early-flowering shrubs. In the South of England it thrives perfectly well in the open, although in unfavourable seasons the large snowy blossoms are not unfrequently injured by frost in many places. It, however, bears cutting in well, and flowers freely against a wall, where, of course, frost is not so much to be feared. The finest specimen known to the writer is one at Syon House; this is twenty-five feet high, with a spreading head more than thirty feet through; when in flower this tree forms a picture not readily forgotten by any lover of a garden. The variety *Soulangeana* differs from the type in its purple-tinted petals; it originated many years ago in France, and is supposed to be a natural hybrid between *M. conspicua* and the Japanese purple-flowered *M. obovata*. *M. conspicua* was introduced to British gardens hardly a century ago, but it has been cultivated by the Chinese and Japanese from time immemorial.

M. cordata (the Yellow Cucumber-tree of the Eastern United States) was introduced to Britain at the very commencement of the present century. In the South of England, at any rate, it is quite hardy, and forms a fine tree with green, ovate leaves, more or less heart-shaped at the base, the upper surface being smooth, and the lower tomentose; the faintly-scented yellow flowers are three or four inches across, the inner petals being frequently marked with reddish lines. In autumn the decaying leaves turn a rich coffee-colour in sunny open spots.

M. glauca, another species from the Eastern United States, is, in sheltered places, a sub-evergreen. The leaves are leathery in texture, oblong or oval in outline, bluish-green above and silvery below; the globular flowers, which are produced by old plants, are deliciously fragrant, a rich cream-colour when they first expand, gradually changing to a pale apricot hue. In damp sheltered places it attains a much larger size than in dry open spots; in its native swamps it grows sometimes to a height of twenty feet. It is the Laurel Magnolia, or Sweet Bay of American writers.

M. grandiflora, a native of the Southern United States, is a stately evergreen tree in favoured places

in the South of England, &c.; in Georgia it is met with 100 feet in height, with a trunk three to four feet in diameter. In many places even in the South of England, and certainly in most other parts of the country, it is safer to treat it as a wall plant. The best variety for general cultivation is *lanceolata*, better known as *Exoniensis;* this is a more profuse bloomer than the taller, larger-growing type.

M. obovata, or, as it is sometimes called, *M. purpurea*, is a deciduous shrub, considerably smaller than *M. conspicua;* it has purplish flowers, leaves of different form and texture from those of the species just mentioned, and camphor-scented wood. In most places in the Northern counties it would require the protection of a wall. A large number of garden varieties have originated, varying a good deal in size and depth of colour of flowers; the best of these is *Lennei*, which is a stronger grower than the type, with large flowers, the outside of the petals being almost black at the base, and gradually lightening towards the tips. A few years ago a specimen at Merriott was described in *The Garden* as being about fifteen feet in height, and as much through, bearing upwards of a thousand flowers. This form was discovered in Italy, and is believed to be a natural hybrid between *M. conspicua* and *M. obovata*. *M. obovata* is a native of Japan, and like *M. conspicua*, has long been cultivated by the Japanese and Chinese.

M. stellata is one of the more recent introductions, and no large specimens yet exist in this country; it seems perfectly hardy—in the South of England, at any rate—and is one of the most distinct and beautiful of all flowering shrubs. The handsome fragrant flowers measure about four inches across, and the numerous narrow petals are white, with an external stripe of pale pink. In Central Niphon, and the woods of Fusi Yama, it is said to form a small tree; in this country it makes a compact dwarf bush, and flowers very freely in a small state; it is a deciduous species.

M. umbrella (the Umbrella-tree of the Eastern United States) has large, slightly-scented, white flowers five to eight inches across, and large, green leaves one to three feet in length. It is a striking plant both on account of its flowers and leaves, and one of the most distinct and desirable of deciduous trees, either as a single specimen on a lawn, or as a member of the mixed shrubbery. In a wild state it rarely exceeds forty feet in height.

Menispermum.—Only two species are included in the genus *Menispermum*, which gives its name to the natural order *Menispermaceæ*. One of these is a native of North America, the other of Eastern Temperate Asia. The former, *M. Canadense*, the Canadian Moonseed, is a pretty twiner, with stalked, three to seven-angled or lobed leaves, peltate near the edge, and axillary panicles of small white flowers, produced in July; these are followed, however, by black fruits (covered with a fine bloom), about the size of a small Sloe.

Menziesia.—There are about seven species in this genus of Heathworts, all of them natives of North America or Japan. Like most of the shrubs belonging to the order *Ericaceæ*, they like peaty soil, and thrive under conditions which suit Kalmias, Ledums, &c. They are deciduous shrubs, with urn-shaped or bell-shaped flowers, and alternate, stalked, obovate or elliptic, entire leaves. Some of the plants formerly referred to *Menziesia*, and still mentioned under that name in gardening periodicals, belong to different genera; for instance, St. Dabeoc's Heath, *Dabeocia polifolia*, now frequently bears the name of *Menziesia polifolia;* and that extremely rare British evergreen, *Phyllodoce taxifolia*, which, as far as the British Isles are concerned, is confined to the Sow of Atholl, in Perthshire, is not uncommonly grown as *Menziesia cærulea*.

Mespilus (*Medlar*).—The cultivated Medlar in its different varieties is quite distinct in general aspect from the truly wild *Mespilus Germanica*, which is a small, much-branched, spinous tree, with smaller fruit; it is a native of Europe, Asia Minor, and Persia. *M. Smithii*, a native of the Caucasus, is a handsome small-growing tree, which bears a profusion of snow-white flowers in May and June. The oblong, elliptic, serrated, dark green leaves bear a considerable resemblance to those of some species of *Cratægus*. This species is a handsome, ornamental, deciduous shrub, thriving in almost any soil or situation; it can be increased either by seeds, or by grafting or budding, using the common Thorn as a stock.

Morus (*Mulberry*).—This genus contains, according to some authors, about a dozen distinct species; others reduce this number to five. The only ones of much interest as garden plants are mentioned below. *M. alba*, the White-fruited Mulberry, is said not to be hardy enough to withstand the rigours of English winters, except in the southern parts of the country, where, however, it forms picturesque trees some twenty or thirty feet or more in height. In spite of the name the fruit is very frequently of a pale red colour. It is this species which is most in request for feeding silkworms, and in Southern Europe and elsewhere it is largely cultivated for that purpose. The leaves of *M. nigra*, the common Mulberry, are also used, but the silk produced by silkworms fed on

them is inferior in quality to that yielded by those fed on the leaves of the White Mulberry. Both the above species are probably natives of China and Northern India, but as they are naturalised in many countries, and have been largely cultivated from time immemorial, it is difficult to ascertain with certainty their exact homes. *M. nigra* is probably the hardier of the two species, and forms low trees with large spreading heads, bearing enormous crops of its very pleasant fruits on almost any soil, or in almost any situation in the South of England. *M. rubra*, the Red Mulberry of the Northern United States, has long, dark purple, sweet and edible fruits, and oval heart-shaped, serrated leaves, rough above and downy beneath; in autumn these turn a fine red before falling. In its native country it sometimes attains a height of seventy feet, with a trunk two feet in diameter; the wood is yellowish, heavy, and exceedingly durable, and is valuable for posts, fences, rails, &c. Formerly it was to some extent employed for shipbuilding.

Myrica.—This genus, which is represented in the British *flora* by the Sweet-Gale or Bog-Myrtle, *M. Gale*, is the only one in the order *Myricaceæ*, and is distributed throughout Europe, temperate and tropical Asia, South Africa, and North America. Practically there are only three species which are hardy in this country, and these are low-growing, interesting, deciduous shrubs. *M. asplenifolia*, or *Comptonia asplenifolia*, is the most ornamental of the three; it makes a neat bush some two or three feet in height, and is clothed with pretty, sweet-scented, Fern-like leaves. *M. cerifera*, the Bay-berry, or Wax-Myrtle, has oblong-lanceolate, shining, resinous dotted leaves, which are either entire or wavy-toothed towards the apex. This grows from three to eight feet high, and, like the last, will grow in dry, poor soils; both are natives of North America. *M. Gale* is found throughout the northern hemisphere, and affects moors and boggy places. It is a twiggy shrub two or three feet high, with fragrant, shortly-stalked, wedge-shaped, serrated leaves; the flowers appearing before the leaves develop. In this country it is much used in cottage practice, and a kind of beer prepared from it is largely used in some districts during harvest, &c.

Myricaria.—Of the three or four species of this genus, probably only one, *M. Germanica*, is cultivated in this country. It is a pretty, deciduous shrub, from four to eight feet or more high, with small Heath-like leaves, and reddish flowers in terminal spikes. It is a native of Central and Southern Europe, and is almost a continuous bloomer. In dry soils it thrives very well, and forms a beautiful feathery bush. The genus differs principally from *Tamarisk* in the ten stamens being united into a short tube at the base.

Negundo.—The members of this genus only number some four or five, and were formerly included, and indeed are even now retained by some authorities, in *Acer*, from which, however, they differ in the absence of a disk in the dicœcious flowers, and in having pinnate leaves. *N. aceroides*, the Box Elder or Ash-leaved Maple of North America, is extensively planted in this country, and elsewhere, as a shade or avenue tree. The type is a small but handsome tree, with light green twigs, and very delicate drooping clusters of small greenish flowers, rather earlier than the leaves. In his "Trees and Shrubs of Massachusetts," Emerson states that "in its saccharine properties it is almost equal to the Sugar Maple, and excellent sugar has been made from its sap." The most marked varieties are: *crispum*, with variously cut and curled leaves—this form, however, is not so vigorous a grower as the type. *Laciniatum* is even more extreme in leaf characters than the last, and like it, is not so good a grower as the typical plant. *Variegatum* is perhaps the most popular of variegated deciduous trees or shrubs, and makes a fine object either planted singly on the lawn, or in company with dark-leaved deciduous or evergreen shrubs in the pleasure-ground; it is also very useful as a pot plant for furnishing and general decorative purposes. This variety "originated as a chance branch sport in a nursery at Toulouse towards the close of the first half of the present century, and for many years seemed to have remained almost unknown, until, at a horticultural exhibition at Toulouse, it was awarded a gold medal given by the ex-Empress of the French." A complete account of its history may be found in the *Gardener's Chronicle* for 1861, p. 867. *Violaceum* only differs from the type in having the young shoots covered with a glaucous-violet bloom. The various forms above-mentioned are easily propagated by budding on the type, which may be raised in quantity from either imported or home-grown seeds; they flourish in almost any soil or situation, and are perfectly hardy in this country.

N. cissifolium is a very pretty shrub, or small tree, from Japan; it has small, light green, trifoliolate leaves. *M. Californicum*, from the Western United States, principally differs from *N. aceroides* by its three to five smaller and narrower leaflets, which are coarsely toothed, but less distinctly lobed than those of that species.

Nuttallia.—This genus contains but a single species, *N. cerasiformis*, a pretty, free flowering,

deciduous shrub, or small tree, producing its racemes of white flowers in early spring. Well-established plants in favourable localities not unfrequently produce their rather large, purple, Plum-like fruits on the Continent, and in all probability would do so in this country were the species tried more generally. This interesting and beautiful member of the great Rose family is a native of California, and is quite hardy in most places in England.

Nyssa.—Some three or four of the half-dozen species contained in this genus of *Cornaceæ* occur in North America, the others are found in Eastern Himalaya, the Khasya Hills, and Malaya. Only those from the United States are of any interest from a garden point of view, and these are decidedly worth growing. *N. capitata*, the Ogeechee Lime of the Southern United States, is a small tree with an oblong, red, Plum-like fruit, which is agreeably acid, and can be employed as a substitute for the Lemon. *N. aquatica*, the Water Tupelo, is also a native of the Southern States, where it is principally found in low wet grounds. Both the preceding would certainly thrive near ornamental water, or in damp positions, throughout the South of England. *N. multiflora*, the Pepperidge, or Black or Sour Gum, is a middle-sized tree from the Eastern States; the bright crimson assumed by the decaying leaves in autumn, renders this a valuable ornamental tree for producing striking effects in the landscape. It has horizontal branches, and a flat spray not unlike that of the Beech. This species succeeds—although it grows rather slowly—in poor, dry, gravelly soils; in good deep loam it makes much quicker growth. *N. uniflora*, a swamp species from the same region as the last-named, has oblong blue fruits, and long-stalked, entire or toothed, oblong or ovate leaves, somewhat heart-shaped at the base; unlike *N. multiflora*, the wood of which is firm, close-grained, and unwedgeable, this has soft and very light wood —that of the roots being sometimes used as a substitute for cork.

Osmanthus.—As now understood this genus of *Oleaceæ* comprises about seven species, natives of North America, Eastern Asia, and the islands of the Pacific Ocean. The two or three Japanese species are those which are of most interest from a garden point of view, and consequently no others are mentioned in these notes. *O. aquifolius* is a fine evergreen shrub, with thick glossy leaves, which present a remarkable resemblance to those of the Holly. The flowers are white, exquisitely fragrant, and are produced in clusters from the axils of the leaves. This species varies very markedly in leaf outline, and there are gold and silver variegated forms. *O. ilicifolius* is perhaps only a variety of *O. aquifolius*, from which it differs in its smaller leaves; of this, too, there are variegated forms. One of the most striking of the numerous green-leaved states is *O. myrtifolius*, a fixed sport, with rigid spineless leaves, introduced from Japan a few years ago by Messrs. Veitch. *O. fragrans* is hardly so well able to bear the cold of British winters as those previously mentioned, but it thrives against a wall in many places, and in the South-western counties flourishes without any such protection; its deliciously-scented flowers are said to be used in China for the purpose of scenting tea. All are readily propagated by cuttings, a stock of the rarer variegated forms being more quickly obtained by grafting on the green-leaved stock, or even on Privet or Phillyræa.

Ostrya.—Of this genus there are but a couple of species, one of which is confined to South Europe and Western Asia, and the other to North America. Both are very ornamental, hardy, deciduous trees, well worthy of much more general cultivation than is at present accorded them. The common Hop-Hornbeam, *O. carpinifolia*, has leaves much resembling those of the Hornbeam—to which indeed the genus is very nearly allied—and female catkins which mimic those of the common Hop. *O. Virginica*, the American Hop-Hornbeam, Lever-wood, or Iron-wood, is similar to its European congener, but does not attain so great a height. The *Ostrya* belong to the *Cupuliferæ*, or Oak family, and are best raised from imported seeds—although the species fruit freely enough in this country, and are very ornamental when laden with their Hop-like fruits, seeds do not appear to be ripened in this country—or they can be grafted on the common Hornbeam. They seem indifferent to soil, and thrive thoroughly in a poor dry gravel.

THE FIG UNDER GLASS.

By William Coleman.

THE Fig (*Ficus Carica*) dates back from more remote antiquity than even the Vine. The exact date at which it was first brought to England is involved in obscurity; but forming, as it did, as important a product as the Vine itself, many are of opinion that the two were imported together by the Romans about A.D. 280. The Fig, however, being more tender than the Vine, it is supposed to have been lost sight of until it was re-introduced from Italy by Cardinal Pole in 1525. The Fig grows to an immense size at Arundel,

Goodwood, and other places in Sussex, also at Tarring, near Worthing, where a small orchard formerly produced 100 dozen of Figs per day through September and October. Within the last twenty-five years, many of these fine trees have been seriously injured by severe frosts. They still, however, yield as much as 300 dozen per week in good average seasons. Mr. Humphrey, the present courteous proprietor, states that the oldest tree, which stands in the centre of the orchard, three-quarters of an acre in extent, is supposed to have been planted by Thomas a-Becket, and is known locally as the Madagascar Fig. Most likely it was introduced with, or is a descendant from, Cardinal Pole's trees, which were planted at Arundel and Lambeth in 1525, and is the original White Marseilles. The other trees, principally Brown Turkey, a few generations old, look comparatively young by the side of it.

In the Midland and Northern counties, also in Scotland, the Fig requires training against a south or west wall, where, although carefully protected with fern or straw, it is frequently killed to the ground in severe winters. It, however, soon throws up vigorous shoots from the roots, but, owing to their pithy nature, its successful culture when removed from the chalk formation, and the sea influence on the south coast, is extremely precarious. This circumstance has long since led to the culture of this wholesome, delicious, and profitable fruit under glass.

"The fruit of the Fig consists of a hollow, fleshy receptacle, with an orifice in the top, which is surrounded and nearly closed by a number of imbricated scales. The flowers, unlike those of most fruit-trees, make no outward appearance, but are concealed within the Fig on its internal surface. They are male and female, the former situated near the orifice, the latter in that part of the concavity near the stalk. On cutting open a Fig when it has attained little more than one-third its size, the flowers will be seen in full development, and, provided the stamens are perfect, fertilisation takes place at that stage of growth. But it often happens that the stamens are imperfect, and no seeds are formed; nevertheless, the fruit swells and ripens."*

Houses for Figs.—The Fig, like all other fruit-bearing trees, succeeds best where it can have an abundance of light; it also enjoys a brisk heat, and plenty of air and moisture when growing. These conditions secured, it is by no means fastidious, but readily accommodates itself to almost any kind of structure and mode of training.

* Moore's "Treasury of Botany."

Where forcing-houses already exist, a good lean-to, similar to a Vinery or Peach-house, will answer well for early forcing, mid-season, or late culture, while span-roof pits, supplied with bottom heat, are equally well adapted for pot culture. For general purposes an efficiently heated span-roof, running from north to south, cannot be surpassed, but owing to the large amount of glass exposed to the vicissitudes of our varying climate, it is not so economical in point of fuel as the pit or lean-to. To secure a constant supply of ripe Figs throughout the season, say from the first week in April until December, if new houses have to be built, the span-roof pit for early pot trees, the lean-to for the earliest planted-out trees, and the span-roof house for summer and autumn will not only be found adequate, but profitable, as the Fig, unlike all other fruit-trees, continues bearing for a considerable time after the first flush of fruit is gathered.

The site for a Fig-house should be light and open, sheltered from the north and thoroughly drained, it should also be near the boiler, or where there is a command of plenty of heat. Unlike the Peach and the Vine, there is no necessity for external borders, and the internal provision need not be very extravagant, as the Fig, being a gross feeder and a rampant grower, requires a circumscribed space for its roots, and even then autumnal root-pruning often becomes necessary.

As trees are so quickly and cheaply propagated, a narrow border along the back of a lean-to house, if furnished with extra strong trees in tubs or pots, will give a quantity of fine fruit during the time the permanent trees are working upwards from the front border.

The trellis for the training of the Fig in no way differs from that provided for the Vine and the Peach. It should not be less than twenty inches from the glass, with all its rods or bars running longitudinally under the roof. If the wires are placed nine inches from each other they offer facilities for training a main shoot horizontally along every third, leaving two for filling in with intermediate growths, from which the fruit will be obtained.

Fire-heat should be as liberally provided as in early Vineries, as it is a well-ascertained fact that the Fig can be started, and successfully carried through all its stages of growth, at a higher temperature than any other fruit which comes under the forcing gardener's management. Therefore, Hood's tables, given at page 95, Vol. I., should be consulted before the hot-water pipes are put in. All the front lights will open most conveniently outwards, and wet-weather ventilators, as shown at

Fig. 76, p. 326, Vol. III., will be of great service when the fruit is ripe, and a constant circulation of dry, warm air is absolutely necessary. Although the trees will stand a great amount of dry sun-heat after the wood is ripe, and fixed roofs are not injurious, portable lights running in rafters are to be preferred both for benefit, convenience, and appearance. It is easy to imagine a tree started in December, and ripening its wood in July, with its foliage at all times subject to spider, cut off from the refreshing dew and summer rain, and then to turn to another from which a great portion of the lights can be removed in a few minutes when warm showers are falling through August and September, and to arrive at the conclusion that the sash and rafter roof is to be preferred.

The unequal span-roofed house, with its longest slope facing the south, is well adapted for the extension training of trees, which may be planted on the north side in a narrow border, and nailed to the back wall until the shoots reach the roof, where they take to the trellis leading to the ridge, thence downwards to the front, the check to the sap at the apex of the trellis producing a most fruitful growth of young spur-like pieces of wood, which require very little pinching, and, as a consequence, become perpetual-bearing. During the time the growths are covering the south trellis, the front pit is a suitable place for pot-trees, which can be plunged or placed on the surface of the bed, where, if allowed to root through the bottoms of the pots into sods of turf, such kinds as Brown Turkey, and Osborne's Prolific, produce quantities of fruit throughout the season. A house of this kind was planted at Eastnor twenty years ago; the main stems have now covered the back wall with roots, where they are regularly supplied with diluted liquid, and the crops of fine large Figs are enormous. The trellis has long since been covered, and the pruning consists of the entire removal of shoots that have reached the extremity, to make room for others that are following down. The latter never require stopping, but show fruit at every leaf, and throw up plenty of spurs from the two-year-old wood. These are thinned out, and allowed to grow up towards the glass, where, having plenty of light and solar heat, they set clusters of Figs. Attention is drawn to this novel mode of management, to show the amateur that thorough drainage, and a root temperature equal to the mean of the house, are of more importance than deep, rich beds of compost. A large span-roofed house is a most excellent structure for large, strong-growing kinds, including the gardener's sheet anchor, Brown Turkey, which stands as supremely at the head of the Fig family as the Hamburgh does at the head of Grapes. No one tires of it, and no collection of Figs is complete without it. In this house the borders should be raised above the ground-line; the passage along the centre being formed by dwarf walls. The latter, however, are not really necessary to the well-doing of the roots, as retaining walls of turf some distance away from the brickwork answer better. Moreover, the turf being warm and elastic, the roots remain more healthy, and take more food in a liquid form than can be given, or assimilated, when the compost is wedged in between two brick walls. When light houses like this are glazed with large squares of 21-ounce glass closely lapped, the trellis should be from twenty to twenty-four inches below it, and ventilation on a very liberal scale is imperative.

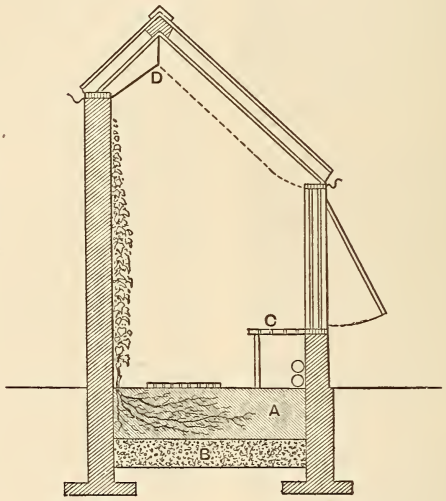


Fig. 1.—Wall Case.

The Wall Case (Fig. 1).—In cold localities unfavourable to the outdoor culture of Figs, this is an inexpensive and a very useful structure, inasmuch as it can be furnished with a row of pot-trees along the front, consisting of kinds which will hereafter be recommended for that purpose. In many gardens good walls, forming sunny, sheltered angles, are frequently met with ready furnished with trees, from which the crops of fruit are very partial, if not a complete failure. These it is unnecessary to destroy, as the front of a wall case can be set on piers, when by judicious root-pruning and improved management, the oldest trees can be speedily brought into a fruitful state. But in the event of the wall having to be planted after the house is built, then the most approved kinds should be selected for training horizontally on a wire trellis placed close to the brickwork. When judiciously managed, it is

astonishing how quickly healthy young trees, on clean single stems, cover a large space, and form fruit-bearing spurs, which frequently ripen well without fire-heat. But in these days of cheap fuel and heating apparatus, the recommendation of an unheated structure of any kind would hardly be keeping abreast of the times, and, therefore, a flow and return pipe should be introduced at the outset.

Borders, Concrete, and Drainage.—Assuming that one or other of the houses here recommended has been erected, the first step will be the preparation of the borders. These it has been stated should be confined to the interior, as the roots of the Fig do not require much water when the trees are at rest. They should be elevated, as the roots rejoice in warmth when the trees are growing and ripening their fruit and wood, and there should be no possibility of stagnant water hanging about after it has passed through the compost. Last, and equally important, each tree should have its own allotted root-space, and that not too extensive, as over-luxuriance is the most frequent difficulty with which the Fig-grower has to contend. To surmount this difficulty, an excavation equal to the depth of the drainage will be sufficient; in some cases the drainage may be raised up to the ground-line. A six-inch drain will be needed to carry off the water, and the whole of the bottom must be well concreted. When this is dry, build four and a half inch brick walls across the area. Allow one square foot of border to every square yard of trellis. Let the concrete slope from every direction to the drains, which bed in concrete, and defer putting in the drainage until after the lime is set.

Drainage.—Twelve inches of clean broken stone or brickbats, especially the latter, on the surface of the concrete, will make a good bottom. Although the whole of the borders may not be made at once, the sections allotted to each tree being small as compared with Vine borders, they may be prepared individually over its whole space, as if it were a large pot, by placing the roughest pieces at the bottom, and finishing with the smaller particles over the surface. Place thin sods of turf of a sandy nature over all, grass side downwards, and the foundation of the border will be ready.

The barrel-drains for lean-to houses should run along the outside, and parallel with the front walls; those in span-roofed houses underneath the centre path. Before the drainage is put in, lay rows of three-inch drain pipes, three feet apart, transversely across each compartment, and let them rest on the concrete with outlets in the mains.

Compost.—The Fig is one of those good-natured trees which seems quite capable of getting its living out of anything, provided it is not checked by drought, or swamped by cold, stagnant moisture; but this accommodating nature does not alter the fact that some soils suit it better than others. Where loams of varying quality can be obtained, that known to gardeners as medium calcareous, and inclining to sandy, is to be preferred; but if a heavier soil must be used, then the usual corrective agents, such as burnt earth, broken bricks, sand, and best of all, old lime, mortar, or plaster, must be introduced. The turf should be cut from an old pasture when it is dry, and if placed where it can be protected from rain, it may lie for a winter, or it may be used as soon as the grass begins to wither. The last condition, if free from wire-worm, is to be preferred, as there is a chance of fermentation in the heap before the borders are made. When the trees are ready for planting, chop up the turf with spades, add one part of old lime rubble to every three parts of loam, and mix thoroughly. Avoid manures of all kinds, as the trees will most likely grow too fast at first—indeed, for some time after they are planted. Make up the first moiety of the border in each space, allowing sufficient root-run for one year. Beat the compost firmly as it is introduced, and keep it up in position with retaining walls of turf within the limits determined upon. When the bed has been raised to within six inches of the future level, defer putting on the remainder of the compost until the trees are shaken out and planted. If fresh turfy loam cannot be obtained, good garden soil, not over-rich in manure, the trimmings from the sides of limestone roads, old lime rubbish, and pounded bricks will make an excellent substitute.

Propagation.—The Fig can be raised from seeds, single eyes, cuttings, layers, and suckers. If a branch is pegged down on the surface of a moist border, or trained against a damp wall under glass, it speedily throws out a network of roots, and produces a healthy and fruitful growth.

Seedlings are easily raised by sowing in well-drained pots filled with sandy soil, and plunged in bottom heat; but the result being very uncertain, and good varieties already numerous, it is not often practised. When the seedlings are large enough to handle, they should be potted off singly. in three-inch pots, and again returned to bottom heat, where they can be kept growing, and shifted on as the roots require more room, until they are strong enough to be treated as plants raised from eyes.

Suckers.—Where good, old-established trees are found throwing up suckers, these can be detached with roots during the season of rest. If potted and placed in bottom heat they soon make good plants,

but unless carefully selected and manipulated, they are not so clean and handsome as plants raised from eyes or cuttings.

Eyes.—These and cuttings make the best plants, as the wood from which they are propagated is sound and well-ripened, and for this reason they are the two modes generally practised by private growers and the trade.

The wood should be taken from well-ripened trees under glass during the time they are at rest, and laid in under a sheltered wall, where they will be safe from frost. If the plants are to be grown from single eyes, all the preliminaries will be precisely the same as for young Vines, including bottom heat, pots, and soil. The month of February is early enough to put in the eyes, as growth made by plants propagated before that time is liable to be soft and weak from want of light and solar heat. Having prepared a sufficient number of 60-sized pots, select plump eyes from short-jointed, fruitful pieces of wood. Cut them half an inch above and below the bud, make a hole in the centre of each pot large enough to hold a Walnut, fill it up with silver sand, and press in the bud. Give a little water to settle the sand, and place the pots in an intermediate pit for a fortnight or three weeks. By the end of that time have the bottom heat in the propagating pit standing at about 80° or 85°; plunge to the rims in sand or cocoa-nut fibre, and give the soil a little water to moisten it through, but carefully avoid getting the soil or plunging material what gardeners would call wet, not only at the outset, but during the whole of the time the young plants are kept in a close atmosphere. Let the temperature of the air range from 60° to 65° at first, not more, otherwise the buds will get in advance of the roots, and failure will follow; shelter from bright sunshine, and dew the tops of the pots over with a fine syringe when moisture is needful. When the roots have reached the sides of the pots, shift into others a size or two larger, and replunge until they again reach the sides, then gradually, and by degrees, raise them out of the plunging material altogether. From this time keep the young plants near the glass, where they can have more light, and as much air as will prevent them from making weakly, long-jointed growths; gradually discontinue shading unless it be for an hour or two on bright days, and close with sun-heat and good syringing in time for the air temperature to touch 80°. When the young plants reach this stage, their treatment will in a great measure be governed by the purpose for which they are ultimately intended, and as they are not so well adapted for immediate planting out as for pot-culture, their future management will be taken up when plants raised from cuttings reach a corresponding stage.

Cuttings.—The shoots for these should be taken off the trees with a piece of the two-year-old wood attached, to feed and protect the part that will eventually form the base of the cutting during the time they are laid in by the heels in the ground. If cuttings from forced trees cannot be obtained, then straight, short-jointed, well-ripened shoots, from six to twelve inches in length, should be taken from the best fruit-bearing branches on open walls and laid in before the terminal buds, which should be firm and plump, are injured by severe frost. The pots for cuttings may be larger than those recommended for eyes, say three to four inches in diameter; let them be clean, well crocked, and firmly filled with sandy loam; plunge them up to the rims in the bed, and proceed to form the cuttings by making a clean cut with a sharp knife at the union with the two-year-old wood, as in Fig. 2. Remove all the wood-buds that would otherwise throw up suckers from beneath the surface of the soil, and insert one cutting in the centre of each pot, using a little silver sand in the operation. Give a little water to settle the cuttings fairly in the sand, and let the top and bottom heats be precisely the same as for eyes. Carefully avoid getting the soil in the pots, or the plunging material, more than moderately moist, otherwise the cuttings may rot at the base; but keep the terminal points fresh by lightly dewing them over with the syringe, and shade from bright sunshine. As growth proceeds, increase the air and reduce the shading, but do not dispense with it altogether. In the meantime prepare a set of clean six-inch pots, by placing two inches of crocks in the bottoms, and mix up the compost for the first shift. This should not, however, be performed until the first set of pots are well filled but not matted with roots. In order to secure a firm, woody growth,

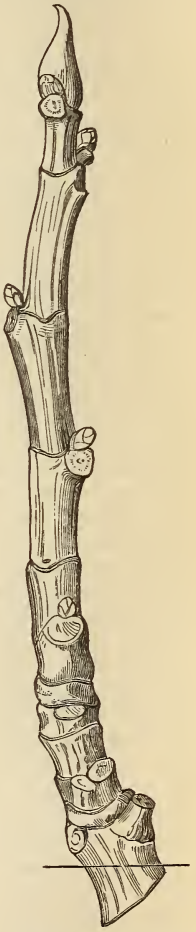


Fig. 2.—Fig Cutting.

good sandy loam, with a liberal admixture of gritty lime-rubble, will make a compost quite rich enough for this, and all future shifts, so long as the plants are kept in pots. See that the balls are properly moistened before they are shifted; pot them firmly, place a stick to each leader, and return them to the pit, where they may be partially pressed into the plunging bed for the benefit of a little latent warmth that will stimulate root-action. These, together with the plants raised from eyes, will now come under the same treatment, which will include liberal syringing every fine morning and afternoon; moderate, but not excessive, watering until the roots have again taken hold of the fresh soil; a gradual increase of air to insure a short-jointed growth, and early closing, in time for the pit to run up to 85° with sun-heat. As soon as the side buds on the old, as well as those clustering round the base of those of the young wood, begin to push, remove them with a sharp knife, and pinch the points of the leaders when they have attained the requisite height for breaking into the first set of shoots for future training. When these buds have broken into growth, and the plants are again ready for shifting, transfer them to nine-inch pots, and place them well up to the glass in a light, airy house, or span-roofed pit, for the remainder of the season.

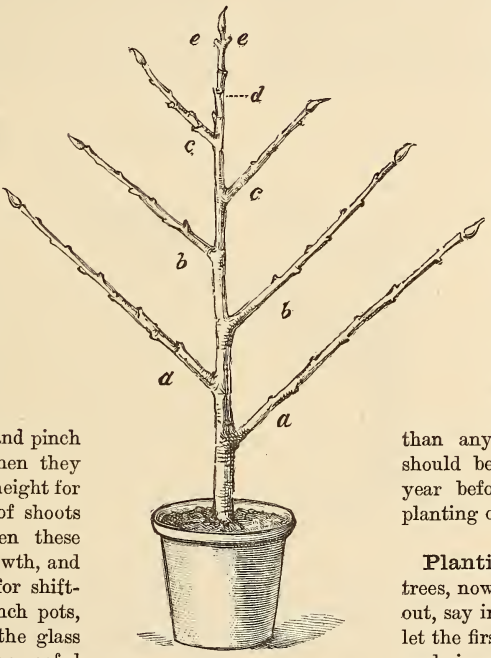


Fig. 3.—Early Training.

Training will now require attention. If the first pair of shoots start vigorously, tie them out horizontally; if weakly, let them take an oblique direction, and again pinch the leader to secure a second pair of side shoots. If all the three top buds do not answer to the second pinching of the leader, the first-formed pair of side shoots must also be stopped to force the sap into them, and a slight incision with a knife may be made in front of any that do not show a disposition to break. Under good management, and pinching of the leaders at every twelve inches, three pairs of side shoots may be formed by the end of August, representing a tree something like the sketch (Fig. 3). Possibly not more than two pairs, *a a* and *b b*, may be formed, the buds at *c c* having failed to break after the third stopping at *d*. This being the case, allow the leader to grow on until the buds at *e e* are formed, and the foundation of two more shoots at *e e* will be laid for the following spring.

The first year's culture being now nearly over, treat the house to more air and fire-heat if necessary, to maintain a temperature ranging from 60° at night to 80° by day. Water moderately to prevent the foliage from suffering, and syringe regularly to keep it free from spider. Continue the treatment until every inch of wood up to the terminal bud is ripe, then with the ripening foliage allow the heat and moisture to decline. When the trees have gone to rest, place them against a back wall in a cold, dry house, and cover the pots up with old tan, fern, or litter for the winter. As trees prepared in this way are not often met with in nurseries, the preparation of home-grown trees, which, owing to the special attention devoted to them, will generally start better than any that can be purchased, should be commenced at least one year before they are required for planting out.

Planting.—Assuming that the trees, now at rest, are to be planted out, say in March or early in April, let the first section of the borders be made in each compartment some time in advance. If the compost has been properly prepared under cover, and is dry, beat or tread it firmly to prevent it from settling or holding a quantity of water in suspension, and then leave it. Remove the trees from their winter quarters into the house about to be planted, examine the buds, and if more than the requisite number—that is, three at the apex of the leader *e e*, and the pair that did not break at *c c*—are present, remove them with the point of a knife, and dress with styptic to prevent bleeding. Early in March give a little water to excite the roots, and allow them to stand until the buds begin to swell. If any of them show a disposition to remain dormant, make an incision in front of them, and tilt the plants on their sides with those particular buds upwards. If this does not produce the desired effect, crush the terminal bud, when one of the incipient buds at its

base will form a new leader. Turn the plants out of the pots, and wash the roots clear of crocks and soil; carefully uncoil them, and shorten back the strongest, then remove any buds that may have formed at the base of the stem, and place the tree in position, spread out the roots horizontally, and cover with three inches of the compost. As newly-made borders always settle a little, no matter how firmly they are made, any attempt at tying-in would strangle the roots, therefore the shoots should be loosely slung to the wires until the time arrives for training. When all the trees are planted, give a little tepid water to settle the soil closely about the delicate fibres, and syringe every day to feed the buds during the time new spongioles are forming.

The distance the trees should be planted from each other must, as a matter of course, be regulated by the distance at which the brick divisions are built across the border, and the mode of training. If the houses are thirty to thirty-six feet in length, the lean-to would require three trees ten to twelve feet apart, and the span-roof would take double that number—three on each side. It is a great mistake to crowd Fig-trees, and to have to cut them before they have grown themselves into a thoroughly fruitful condition, as the use of the knife only induces a stronger growth. Neither is it advisable to plant supernumeraries; the time and space devoted to such might be much better employed on pot-trees, which would be portable and more profitable. The young stock from eyes, or cuttings, grow rapidly into pyramids for the back rows, and bushes for the front, wherever there is room for a pot-plant to stand without being shaded by the advancing permanent trees, and as these can be fruited the second year they are in every way preferable to supernumeraries.

Training.—As successful culture depends upon keeping the tree in a firm, short-jointed, sturdy kind of growth, a system of training that will secure this should be adopted. The old school allowed their trees to grow almost wild, the modern Fig-grower works upon a system, and keeps them well furnished, but not crowded, with young fruitful wood, by allowing the leading shoots to extend until they reach the extremity of the trellis, when they are cut out to make room for others that are following; by judicious pinching up to July, not later; and by shortening back a portion of the ripe wood at the winter pruning, where there is likely to be a dearth of young growths in the following season.

The young tree (Fig. 4) can be trained horizontally or obliquely, the growths that emanate from the main shoots being pinched at the fifth or sixth leaf, where they show an inclination to continue growing; not otherwise, as short stubby pieces with a good terminal bud are always most fruitful. Hence the advice to give up pinching after the middle of July, as every shoot that is pinched should make and ripen a fresh break with a good bud before the tree goes to rest.

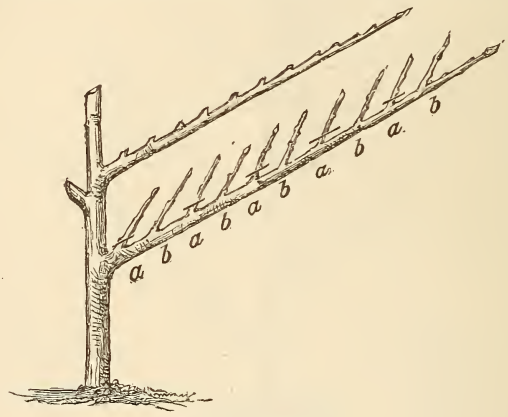


Fig. 4.—Stopping.

A medium course of training, stopping, and pruning will be found the best by all who have not had great experience in the management and manipulation of the irrepressible Fig. In order to secure a good foundation to the young tree now commencing its first year's growth on the trellis, the leader should be pinched at every fifteen inches throughout the summer, and the main side shoots as often as may be found necessary to induce the back buds to break into laterals. Some prefer keeping all their laterals on the upper side of the branches, and tying to the wire above; others tie them in on both sides, above and below. In my own management a downward tendency answers best for all free growths, and a right-angled growth towards the glass for short, spur-like pieces, which always set a cluster of young fruit, and revel in the roasting of the August sun.

If all has gone well until the end of the season, the young tree, under ordinary Vinery treatment as to heat and moisture, will have covered some six feet of the trellis, and will represent a series of young branches, well furnished with shoots that have been tied in, and pinched at the fifth or sixth leaf, where necessary, to keep them within bounds. No fruit will have been ripened, but every lateral will be set with embryo Figs, ready to swell away in the following spring. Therefore, in order to prevent these from getting too forward before the leaves fall, the syringing should be reduced, and the temperature lowered, in time for the wood to be thoroughly ripe

by the end of September, when the lights may be drawn off to give them the benefit of rain and dew. In this condition the tree will remain until the time arrives for the winter dressing, when the shoots marked *a* will be pruned back to a single bud for a summer growth of wood, which will be made during the time those marked *b* are ripening off the early crop of fruit. It should be borne in mind that the earliest Figs a tree produces are formed at the base of the leaves, near the terminal buds, on well-ripened growths of the preceding year. These young fruits when the trees go to rest should not be larger than No. 1 shot. The second crop of fruit is obtained from the early summer growths of the current year, and therefore to secure this succession, and to keep the trees well furnished with bearing wood, a portion of the growths must be cut back to a single bud every year.

Stopping.—Where a young shoot is wanted, it is frequently obtained by cutting a notch in the wood in front of the bud; but when this does not produce the desired result, stopping or pinching is resorted to. It may here be observed that it is not necessary to remove the point of a young shoot, as crushing it with the finger and thumb without breaking the outer bark is quite sufficient to throw the sap back into the side buds, and to prevent the terminal bud from progressing further, and as this can be done without causing the young shoots to bleed, crushing is generally preferred. By stopping at the third or fourth leaf on the shoots *b*, we increase the size of the fruit, which we wish to have as large and early as possible. By stopping at the sixth leaf the early summer shoots which are obtained from the buds *a*, we induce young Figs to form in the axil of every leaf, and to swell forward as a succession to the fruit obtained from the shoots (*b*) of the previous year. By this means we maintain the balance of the trees by forcing the sap back into the weakest growths, which would not otherwise swell up fruit, and we keep every part of the trellis evenly furnished, but not overcrowded, with foliage and firm fruit-bearing spurs.

Tying.—Unlike many other fruit-trees, the Fig is most accommodating in this respect, as it can be turned and bent in any direction, wherever a fruiting point is wanted, and shoots so tied do not resent this treatment, but seem to become more fruitful by the check which follows. All leading and strong intermediate shoots should be kept regularly tied to the wires until the growing season is nearly over, when it is a good plan to allow the points to turn up to the influence of sun and light. Short-jointed shoots and spurs, which should always be encouraged, do best when they are not too closely tied in, and seem to enjoy an abandoned kind of growth upwards, towards the glass. They should not, however, be allowed to touch the glass before they are drawn down, neither should they be closely tied late in the season.

Where the arrangement of the house, or trellis, does not favour training to a single leader furnished with a regular set of side shoots, extension training on the fan system, either up or down the wires, is quite as applicable to the Fig as it is to the Peach or Vine. Under this mode of training, branches are continually reaching the extremity, when they are cut out in winter, while others that are following take their place, exactly the same as the young canes in a Vine that is trained upon the long rod principle. Under the first method, the trees are made to produce two distinct crops of fruit, a period intervening between the two crops when there is no ripe fruit. Under the second system the trees are kept constantly extending, when every advancing shoot becomes a perpetual bearer, as it produces as many Figs as it does leaves. I have kept a Brown Turkey Fig in constant bearing from the middle of May up to the end of October, and have then thrown off the lights to force it to go to rest.

Lifting, Root-pruning, and Renovating.—Although poor compost free from animal manure should be used in the formation of a border for Figs, it is no unusual occurrence for the trees to get into a gross habit of growth, particularly where the first moiety of the border is made larger than is actually necessary. Extension training, and heavy cropping, will sometimes correct this tendency, but not always, as trees once thrown off their balance refuse to be burdened with a heavy crop of fruit. When this tendency to grossness puts in an appearance, steel forks should be brought into use as soon as the leaves fall, care being observed that the remains of rich mulchings do not get mixed with the compost during the operation. With these implements work from the extremity of the border inwards to within two feet of the stem. Avoid disturbing the drainage or the turf resting upon it. Strong roots that have made the descent, and are most likely doing the mischief, may be cut off, all others being carefully preserved. Keep the roots moist during the time they are exposed to the air, return the soil and ram it firmly up to the proper level, then re-lay them in a thin layer of pure sandy loam, give a little water to settle it, and return the remainder of the old compost. Where fermenting material is used for starting early Figs, it is no unusual thing for young trees to break away into strong growth a second and a third time. The only sure remedy is lifting; but

prevention being better than the best of remedies, it is a good plan to fork down a piece of the border every autumn, and to add a little more fresh soil from year to year until the allotted space is full. If the trees still show an inclination to grow too strong after the trellis is filled, a trench two feet in width may be taken out along the front of the border, and all strong roots pruned back, when a new turf wall some little distance away may be built up to keep them from again touching the brickwork.

Renovating Old Trees.—Although the Fig is more likely to become gross than weak, it does not follow that the compost never requires renovating. In course of time the fibre dies out of the turf, the compost becomes sour and pasty, and the most valuable roots perish. The trees then begin to make long-jointed growths, the leaves become thin and flabby, and the fruit very often drops when it should commence its last swelling. When these symptoms assert themselves, the remedy must be again sought in lifting the roots; but instead of returning the old compost, cut away all unhealthy roots, correct the drainage, and cover it with new sods, grass-side downwards. In the meantime prepare fresh compost similar to that recommended for new borders, and re-lay the roots within a few inches of the surface. It is hardly necessary to inform the readers of these pages that the best time to perform this operation is as soon as the second crop of fruit is gathered, and as this severe check will tell upon the trees, the house should be kept warm and moist by frequent syringing until the roots have taken to the new compost.

THE POTATO.

By William Earley.

THE Potato, a perennial plant, is supposed to have been first brought to England on the return of the colonists sent out to America (Virginia) by Sir Walter Raleigh during the year 1586, though it did not become very popular for some time afterwards. It nevertheless grew so in favour eventually that we are told during the year 1796, in the county of Essex alone, about 1,700 acres were under culture with the tuber for the use of the London markets. From that date onward it has been held in much esteem, until to-day it is in higher demand than ever; and this notwithstanding the fact that the virulent disease attacked it, which first made its appearance during the month of August, 1845, and caused in some seasons a loss of three-fourths of the entire crop, and great pecuniary injury to growers.

Happily, the culture of the well-called "noble tuber" has advanced, in a scientific point of view, more during the past decade than ever previously; so that, what with improvement of varieties, and more thoughtful preparation of soils and planting, results are generally of a satisfactory nature.

To succeed in the culture, practice must therefore, whether large or limited quantities are grown, be in accord with such data as have been gained by experience from very varied sources. For many years following the introduction of the tuber, it was subject to what may be termed a very gross system of culture —such a system, in fact, as no other kind of cultivated plant has been subjected to. Any kind of soil upon any site was considered fit for it. The most rank of crude manures were applied, and in very contact with the tubers. Happily, however, during much of that time autumn planting was resorted to, a practice which gave the soil time to in a great measure neutralise, by its deodorising influences, the excessive rankness. It was a common practice to form trenches, place thick layers of pig-manure and others therein, and to press the seed-tubers, often cut into divisions, down thereon, and to then bury all together.

For some time previous to the first appearance of the disease which the plant has of late years been so subject to, spring planting took the place of autumn planting, and probably to this fact, associated with thickness of seed-sowing, is to be attributed the inherent weakness of the species, which made it subject to the dire disease. Beyond this, "sets" or "seeds" were chosen indiscriminately from year-after-year grown stock, these generally being the smallest tubers, and consequently ofttimes the progeny of the weakest haulms, &c., all going together to make up a most careless, as it was a thoughtless system, such as in due time ripened into most destructive results.

Fortunately, advanced horticulture proved prepared for the emergency, the result being, with cultural consideration and practice, such as we now hasten to describe. This invaluable tuber bids fair to continue in its present state, enjoying greater immunity from attacks of the disease and continually increasing quality and prolificacy, proving second only to Wheat as a staple product of immense annual value.

The soil which suits it best is as new and good a yellow loam as can be insured for it, possessing from one-seventh to one-eighth of sandy components. The sound maiden loam of old pasturage-land when it has to be broken up is the best possible kind for this crop. Whatever site be chosen, however, it should be an exposed one, not unduly subject to shade from trees, &c.; an upland one for preference, or where good drainage exists, efficient for the carry-

ing away of all storm-rains, and every other kind and degree of its excess of latent moisture. The ground should be worked, or manured and dug deeply, between the months of November and February. A very liberal dressing of good, partly decomposed manure should be used, and the soil in process of digging should be simply turned over, and let lie loose and lumpy as turned over; the process, far too generally employed, of chopping over and breaking down such rough surfaces, being most objectionable, as it destroys the primary intention, which should be to permit the air full play down into and amongst the soil, to the fullest extent possible.

In very many districts such a favourable soil as we have referred to does not exist. In connection with stiff heavy soils, a dual digging, or working, during the winter, choosing always dry periods for the work, is highly desirable. The addition of sandy soil, road-scrapings, ditch-trimmings, from the base of dry banks, any form of burnt rubbish, wood-ashes, &c., to such is highly desirable. The most stony portions adjoining, or in connection with, heavy soils are more desirable than those more clay-like in their composition.

Having the soil prepared in these preliminaries as advised, planting should be commenced towards the end of the month of February and during March. During fine, dry weather, when the surface of the soil is moderately dry, neatly fork it over, mixing up the manure previously buried in it with the soil in the operation. It will then be ready for planting. This can be done in a variety of ways; the two simplest being stretching a line across the piece, always, if possible, north to south, and dibbling the seed into the ground along it at the necessary distances apart, or shallow trenches may be drilled beside the line with the hoe. Where good culture is aimed at the latter process is best, though it entails much more labour than the preceding one. In connection with drill-planting, an immense aid may be given to the crop by the addition to the soil of a moderate quantity of artificial manure of certain kinds. The phosphates are excellent for this purpose, whilst for simplicity in the matter of procuration and application, wood-ashes are not to be surpassed. Probably greater results have accrued from the use of the artificial manure known as "Amie's" than from any other. When the drills are drawn, all such aids as these should be simply sown along them, and the sets then placed at equal distances apart therein. Then hoe the soil roughly from both sides upon and over them, leaving it slightly mound-shape over the rows.

The requisite distances such rows should be apart, and the space between the sets in the rows, depend in a measure on the sorts grown. Early and short-haulm varieties will succeed well planted eight inches apart, in rows fifteen inches asunder. Mid-season, late, and large-topped varieties should not be less than twelve inches apart in the row, by twenty inches between rows. The more space accorded to each plant, so much better will be the growth, and the result a heavier and better crop, with greater freedom from disease during even the worst seasons.

Immediately the young growths push through the ground, hoe or work the ground deeply and freely between the plants. Repeat this process when the growth is about three inches in height. Have no hesitation in hoeing deeply close around each plant. Even if each could be, at this stage of growth, lightened up bodily by means of a five-tined fork it would be all the better. Rapid growth then takes place, the roots delight to push into free, generous compost, and the looser and finer it is, so accordingly will better progress be made. After this second hoeing draw soil from both sides loosely up to and against the plants, in such manner as to all but bury the leaf-base. When the plants again so increase in size as to require it, again hoe amongst them, and draw quite a ridge of soil mound-like around them, giving yet another moulding subsequently if needful. No further attention beyond hoeing to keep them free of weeds will be required until the crop is advancing to the perfected state, and digging up the tubers should be attended to.

Owing to the attacks of the Potato disease, which in damp weather is most prevalent, it will be well, if such weather prevail about the date when the haulm shows the slightest symptoms of ripening, which takes place first upon its lowermost leaves, to forthwith dig them up should there be the slightest sign of such disease observable on any part of the plantation. To permit them to remain in the ground one or two weeks longer will be at the risk of losing from twenty to forty per cent. of the entire crop. During fine, dry autumns this is not to be so generally anticipated. In any case, it is not desirable to permit the crop to remain in the ground until the haulm has died down, as the tubers certainly do not improve in quality thereby.

Potatoes are forced or forwarded materially grown in frames. A slight hot-bed is made up during the month of January or February; soil six inches deep is placed thereon, So soon as active growth is observed, all the air possible is given, keeping the temperature at a mean of about 57°. As growth advances fresh soil is added in the form of mouldings-up. With the temperature above given as a minimum one during the subsequent months, air and root-waterings as necessary, a full growth will be made superficially until May 20th, when, if the crop has not been used, the sashes are entirely removed from the

frame, to insure perfectly natural ripening. The better forms of Ashleaf are best adapted for this purpose, and, owing to their excellence of flavour, these alone should be used. Potatoes are often also forced in pots, either in frames or Vineries, Peach-houses, plant-houses, or other structures where a temperature of from 55° to 60° may be commanded. Six-inch pots are perhaps the most useful for this purpose. The pots should be well drained, filled with a mixture of equal parts loam and leaf-mould, and a single set, already sprouted, placed in each.

Concerning varieties or "sorts," it would not be possible to refer to them fully in a work of this character, intended for permanent use. Many remarkable new varieties exist at the date when we write, but as they are annually being added to by others, each an improvement on the last, we anticipate the popular varieties of each year will be speedily forgotten in favour of successful compeers, which will supersede them. All seed lists give, at least, a valuable epitome of the best current varieties. Potato-seeds, or "sets," are best when chosen of medium size, or one size less than medium, from the most productive roots, and such as have produced in company large and fine-formed tubers. It is necessary, when small sets such as these are not procurable, to cut large tubers into two or three for purposes of planting. Large tubers possess too many eyes, which growing so thickly together, enervate each other, to the injury of all. Sets intended for planting do not require to be kept from full air and light as do those intended for cooking. They may even become green with advantage. Keep them quite cool, spreading them out as thinly as possible, to limit premature growing, which greatly weakens them as parent tubers. When seed-tubers have only sprouted to the extent of about half an inch at the time for planting, always plant them with such uninjured if it is possible to do so. This is preferable to breaking the sprouts off. Potatoes keep better properly clamped on cool land and a cool aspect, with a covering of straw between them and the soil with which they are covered, than by any other means.

A good selection of Potatoes is as follows:—

White Kidney-shaped:— Alderman, Avalanche, Covent Garden Perfection, Cosmopolitan, International, Magnum Bonum, Myatt's Ashleaf, Woodstock Kidney, White Elephant—where an immense cropper and immense-sized tubers are desirable. *Coloured Kidneys:*—American Purple, Beauty of Hebron, Late Rose, Salmon Kidney, and Trophy. *Round Tubers (White)*:—Bedfont Prolific, Fenn's Standard, Lady Truscott, Rector of Woodstock, Regent, and Reading Hero. *Round Tubers (Coloured)*:—Adirondack, Beauty of Kent, Reading Russet, and Victor of Laleham.

CHOICE HARDY BORDER PLANTS.

By Richard Dean.

Iris.—This name is derived from *iris*, "the eye," referring to the beauty of the flowers. It is also the *fleur-de-lis* of the French, and being an old plant much traditional lore has gathered about it. There are several main groups to which we will briefly advert. *I. Germanica* includes all the broad-leaved Irises which generally pass under the above name, but which in reality belong to several other groups. Here are gathered together the varieties of several reputed species, all resembling each other in foliage and habit, yet totally distinct in flower, but when taken as a whole they form a group unparalleled in beauty. They will thrive in almost any soil and situation without any care whatever. So numerous are the varieties included under the head of *I. Germanica* that it would be invidious to give a selection from them. Another group comes under the head of *I. Kæmpferi*, a new group of Japanese Irises totally distinct in flower from any other included in the genus. They form in their habit of growth strong tufts of green foliage three to four feet in height, surmounted by large Clematis-like flowers, both single and double, some of immense size, and of almost any shade of colour—red, white, blue, rose, crimson, striped, purple, &c. They prefer sunny, moist situations; should be planted in peat and loam, where they soon become established, and form striking and very ornamental objects. A dozen of the best varieties will be found in Alexander von Humboldt, Cordelia, Henri von Siebold, Ida, Jersey Belle, Krelagei, Macbeth, Othello, Portia, Romeo, Souvenir, and Venus.

Then there is the Crimean Iris, *I. pumila*, the varieties forming a charming group of dwarf spring-flowering forms, growing from four to eight inches in height, producing an abundance of lovely flowers from March to May. They are admirably adapted for the decoration of the border, or edging plants, or for bedding, and as they grow vigorously in almost any soil, they cannot be too highly recommended for spring decoration. This group comprises a score or so of varieties. Then comes *I. olbiensis*, an early-flowering section of dwarf Irises, growing about one foot in height, immediately succeeding the *pumila* section in time of flower. The flowers are large, the colours varied, and produced in great profusion. The group includes a few pretty varieties. There is, in addition, a somewhat numerous group of species and varieties of Iris, including *aurea*, *cristata*, *fœtidissima*, a British species, bearing small purple flowers; the seed-vessels open and show coral-red

berries, very useful for decoration at Christmas: this also has a variety with handsome variegated foliage; *Iberica*, *longipetala*, *nudicaulis*, *orientalis*, *Robinsoniana*, *Susiana*, *reticulata*, *Virginica*, and its varieties *elegantissima*, *pallida*, and *purpurea*. But these require different positions and soils, which can be ascertained at the time of purchase.

IRIS GERMANICA, var. *Neglecta Victorine*.

Liatris.—This represents a genus of hardy herbaceous perennials from South America, doing well in a light, sandy loam, blooming freely, and which are increased by division. One of the best known is *L. spicata*, a handsome plant growing three to four feet in height, the flowers pale purple, a very fine border plant. *L. squarrosa* is a little dwarfer in growth, the flowers of a deeper purple, and the root tuberous. *L. pycnostachya* is the Dense-spiked Liatris, a stout-growing species with very leafy stems, and thick and dense spikes of bloom, the flowers of a pale purple colour; it does well in an ordinary border. All the foregoing are natives of North America, and well deserve a place in the garden, but they should have ample space in which to develop themselves.

Linaria (the *Toad-flax*).—This is a very large genus, comprising half-hardy herbaceous, hardy herbaceous, and hardy annuals, a few of which shall be passed under review. Why called "Toad-flax" it is a little difficult to determine; perhaps from its narrow, linear, Flax-like leaves; and from some incorrect description, such as that of Dodoens, who wrote, "Herba assimilis cum *Bubonio* faculatis," *Bubonio* having been mistaken for *Bufonio*, from *bufo*, "a toad." The generic name, *Linaria*, is derived from the Greek *Linon*, "Flax" — the leaves of the species on which the genus is founded resembling those of the Flax plants.

There are four forms of the *Linaria* that come under the denomination of hardy annuals. Three of

them, viz., *bipartita splendida*, *Maroccana*, and *reticulata aurea purpurea*, are charming subjects: the first has purple flowers; the second pink; the third yellow and maroon; they grow to a height of about twelve inches, and if the seeds are sown in light and fairly good soil in early spring, charming masses of flowers are formed, which are very effective. Then there is a very dwarf form called *multipunctata*, which does not reach a height of more than four inches, and bears orange flowers with black spots.

Of those comprised as hardy perennials, there is the pretty Alpine Snapdragon — *Linaria alpina*—a lovely prostrate little Alpine, which is covered the whole of the summer with deep violet flowers, having the throat orange. This reproduces itself freely from seed, and it cannot be too highly recommended. *L. Cymbalaria maxima* is the Giant Ivy-leaved Snapdragon, a somewhat common and elegant trailing plant, producing its pale blue or lilac flowers all the summer through. It is sometimes found wild in this country, although not regarded as a native plant. *L. origanifolia* is the Marjoram-leaved Linaria, a native of the Pyrenees and South of France, the flowers bluish-violet, with yellow throat. It is of dwarf growth, and does well in the rock garden, or in a light sandy loam. *L. pallida* is distinguished by prostrate masses of deep green leaves, covered with violet-purple flowers, lasting in bloom the whole of the summer; a fine plant for covering banks, rockwork, &c. *L. purpurea* is a rather tall form, growing two feet or so in height, the flowers being purplish-blue, and produced during the summer; it is a native of Southern Europe, and it does well on ruins, on walls, and in stony places.

Linum (*Flax*).—This also includes a large number of species and varieties—green-house evergreens, hardy annuals and biennials, and hardy herbaceous. Linum is from *Linon*, "Flax." The common Flax of Great Britain is *L. usitatissimum*, a plant said to be originally from Egypt, but now naturalised throughout the whole of Europe, and in many parts of North America.

Our purpose is to deal with a few only, and those of a decided value for garden decoration. One of the most popular of hardy annuals is *Linum grandiflorum rubrum*, a native of Algeria, noted for its brilliant colour and for its long continuance in bloom. There are blue, white, and rose-coloured varieties also. The seeds should be sown in March or April in light free soil, and a rare display of bloom will follow. *L. luteum corymbiflorum* is the Sulphur-flowered Crimean Flax, a pretty variety for the garden.

Of hardy perennials there are: *L. flavum* or *luteum*, as it is sometimes called. This is an invaluable border, rock, or bedding plant, forming neat symmetrical bushes a foot in height, covered for at least two months with innumerable golden-yellow flowers; and it is not at all fastidious as to soil or situation. It is a native of Austria and Hungary. *L. alpinum* is the Dwarf Blue Alpine Flax, the flowers large dark blue, a plant that does well in borders, and also in the rock garden in sandy loam. It is a native of the Alps, Pyrenees, and hilly parts of Europe. *L. Narbonnense* is the Narbonne Flax, a beautiful and rather large kind, flowers light sky-blue, with violet-blue veins, growing from one and a half to two feet in height. This beautiful form is not quite hardy, and should be planted in a warm border in well-drained and deep sandy loam. *L. provinciale* is in the way of *L. Narbonnense*, but of rather more compact growth, and bears vivid blue flowers of a very pleasing character. *L. acuminatum* has an erect, slender habit of growth, forming compact tufts, surmounted in the summer with large bright blue flowers more than an inch across; the plant grows to a height of about fifteen inches, and it does well in a deep sandy loam. *L. perenne* is the Perennial Flax, a native species found in the Eastern counties of England, and flourishing on borders and banks in ordinary soil. The plant forms tufts a foot or so in height, and produces, during the summer, bright cobalt-blue flowers of a very pleasing character. There are, it is said, a rose and also a white variety. The latter is known in gardens as *L. Lewisii variegatum*.

Lithospermum (*Gromwell*). — We get the generic name from *lithos*, "a stone," and *sperma*, "a seed"; but why the common name—Gromwell—has been bestowed, we cannot say. It is a genus comprising hardy annuals, hardy evergreens, and hardy herbaceous plants; but it is only with a very few handsome and useful forms of the latter that we have to deal. One of the best known is *L. prostratum*, the Gentian-blue Gromwell. This is a perfectly hardy little evergreen spreading plant, having rich and lovely blue flowers, with faint reddish-violet stripes, about half an inch across, produced in great profusion where it is well grown. A native of Spain and the South of France. Easily propagated by cuttings, very hardy, and peculiarly valuable as a rock plant from its prostrate habit, and the fine blue of its flowers. On dry and sandy soil it forms an excellent border plant, and where the soil is deep and good, as well as dry and sandy, it becomes a round spreading mass a foot or more high. It flowers in early summer, and continues in bloom for a long time. *L. graminifolium* forms ornamental, evergreen tufts of firm grass-like leaves, and branch-

ing flower-stems six to twelve inches high, bearing drooping clusters of brilliant deep blue flowers. This plant does best in calcareous soil, or well-drained and slightly-raised ledges. *L. petræum* is the Rock Gromwell, a much-branched evergreen shrub, with greyish leaves, and terminal clusters of drooping violet-blue flowers. Late in May, or early in June, all the little grey shoots of the dwarf bush begin to exhibit a profusion of small, oblong, purplish heads, and early in July the plant is in full blossom, the full-blown flowers being of a beautiful violet-blue. Being a native of dry, rocky places in Dalmatia and Southern Europe, it should be planted on the rockwork in a well-drained, deep, but rather dryish, sandy soil on the sunny side. *L. purpurea cæruleum*, the Creeping Gromwell, is a pretty British perennial, one to one and a half feet high, blooming in early summer, the flowers reddish at first, changing afterwards to blue. It should be planted in borders, and on the rougher parts of the rockwork, and in a semi-wild state in shrubberies and half-shady positions. It will not thrive on a clay soil, and especially in the London clay.

Lobelia (*Cardinalis type*).—The genus was named after M. Lobel, a botanist, physician to James I. *Lobelia cardinalis*, the Cardinal Flower, was introduced from Virginia two and a half centuries ago. *L. fulgens*, the Glowing Lobelia, which closely resembles *L. cardinalis*, but differs chiefly in being more downy, came from Mexico during the early part of the present century.

It is, perhaps, probable that the very fine perennial varieties of the Lobelia, now so much used in gardens, are obtained alike from *L. cardinalis* and *L. fulgens*. They are numerous, and vary greatly in colour—from white, or pale sulphur, to the richest crimson and purple; they average in growth two feet or so, and do well in borders in rich moist soil. It is the practice to name varieties, but as seedlings are frequently raised, and named flowers increase, it is scarcely worth while to give a list.

At the end of the year the plant throws up suckers round the base of the flowering stems; these should be taken off, potted singly in 48-sized pots, plunged in a moderate bottom heat, in a temperature of about 55°. By the middle of January they require a shift into larger pots, and a little more heat may be given. By treating them in this way, very fine plants can be had in large pots if regularly shifted, and they make remarkably fine specimens for conservatory decoration. Suckers taken off in autumn can be put singly in small pots and wintered in a cold frame; these make good plants for planting out in beds in early summer; and these varieties of the perennial Lobelia are now much employed by gardeners for this purpose. *L. syphilitica* is the Tall Blue Perennial Lobelia, the flower blue, and in summer they form a long, leafy raceme. It is a native of North America, and appears to do well in a moist soil; and when well established in the border it is an object of great beauty.

But there are fine hybrids of *L. syphilitica;* these have been increased of late, and they are becoming very popular. Like their type, they are perennial, perfectly hardy, and wonderfully effective, their flowers being borne on spikes twelve to eighteen inches long, and varying from white, through every shade of ruby and purple, to crimson and scarlet-crimson. In some, the petals are narrow; in others, broad; but all are charming. They bloom rather late in the season, when other flowers are becoming scarce. They do well in a wet peat bed, or the margin of a pond.

Malva (*Mallow*).—*Malva* is probably from the Greek *Malache*, the name of an emollient plant, derived from *malasso*, "to soften." The English name, Mallow, seems to have come from the Hebrew word *malua*, or "saltness," and the name was probably bestowed because "the plant groweth in saltish and old ruinous places, which in most abundant manner yieldeth forth saltpetre." The Musk Mallow is *Malva moschata*, a vigorous-growing native perennial, found in Britain and Europe in calcareous and gravelly soil, the flowers large, rose-coloured and handsome. There is a white variety of this, known as *M. moschata alba*, which makes an admirable garden plant, and should be found in flower borders; the flowers are numerous, and pure white. *Moschata* refers to the musky scent sometimes found in the plant's herbage. It is said that the ancient Romans had some kind of Mallow (*Malva*) served up as vegetables, and the Egyptians, Syrians, and Chinese also use them as food. In Job's days these plants were eaten by the wandering tribes, who, as the patriarch says, "cut up mallow by the bushes, and juniper roots, for their meals." The common Mallow of our hedgerows is *Malva sylvestris*. *Malva Alcea*, a native of France, is the Hollyhock Mallow, a vigorous-growing perennial, three feet in height, and bearing pale rosy-purple flowers. *M. campanulata* is the Bell-flowered Mallow; it is a native of Chili, and grows to a height of one and a half feet, flowering late in summer, in colour light purple. *M. Moreni* is Moren's Mallow, a herbaceous perennial, two to three feet in height, bearing very large pinkish-rose flowers in summer; the leaves resemble those of the common Oak in appearance and colour.

Under this heading, attention may be drawn to two very handsome and serviceable hardy annuals,

viz., *Malope grandiflora*, with its large and striking rosy-crimson flowers; and its white variety, *alba*. Sown in the open ground, the plants grow to a height of one and a half feet, and bloom profusely.

The red and white annual varieties of *Lavatera* are also Malvaceous plants, and make very useful hardy garden plants when the seeds are sown in spring; they grow to a height of eighteen inches.

Then there is the Tree Mallow, *Lavatera arborea*, a perennial, native of Britain, and an imposing-looking plant at the back of a border of hardy subjects. Its variegated variety—the leaves being handsomely striped and blotched with white—is now being much grown as a hardy decorative plant, and it can be raised from seeds with ease. It is known as *Lavatera arborea variegata*.

Matricaria.—This genus, which is allied to the Camomile, is mentioned for the purpose of introducing a most useful hardy perennial, *Matricaria inodorum fl. pl.*, the flowers of which are pure white and exceedingly double, like those of a giant Camomile. It can be raised from seeds, and, when planted out, quickly grows into a good size, and produces large numbers of flowers all the summer. A better plant for cutting from can hardly be named, and it should find a place in every garden.

Mimulus (*Monkey-flower*).—The generic name is given to this plant from *mimos*, "an ape," in reference to the ringent or gaping mouth of the flower. The Mimulus has long been a favourite flower, and our improved large-flowered varieties have been derived from *M. luteus*, the Yellow Monkey-flower, introduced from Chili in 1826. It has been greatly improved of late years, and now we are in possession of strains of wonderful size and great beauty, that are valuable as pot plants, or for culture in the open ground. Some years ago, the Coppery Mimulus—*M. cupreus*—was introduced from the Andes of Chili, a dwarf and very free-blooming species, with peculiar copper-coloured or reddish-brown flowers. It is perfectly hardy, and grows freely in the open ground. This was used for crossing our large-flowered varieties, and a wonderful freak in colour resulted. These fine improved varieties of Mimulus seed freely; and plants can be raised with the greatest ease by simply sowing a few seeds in a pan or pot of light soil, placing it in a green-house, pricking off the plants when large enough, and growing them on into size.

M. cardinalis is the Cardinal Mimulus, a native of California. It is a very showy perennial, and flowers in summer, the blossoms being bright-scarlet. It does well in the open border in moist soil, and, like the large-flowered varieties, can be increased by means of seed or division of the roots. It is an excellent pot plant, and in some parts of the country is much grown by cottagers for window decoration. *M. Tillingi* is a tall, free-flowering, and hardy perennial, much grown in gardens. The flowers are medium-sized, in colour yellow, spotted with brown.

M. moschatus is the common Musk. It is one of our most popular plants, and was found near the Columbia river, on the north-west coast of America. Every one knows it, and so there is no need to describe it. Harrison's Musk is a large-flowered variety obtained by crossing the Musk with a large-flowered Mimulus; the flowers are yellow, spotted with brown. It is a strong grower, very free, and much grown for decorative purposes. It is well known as *Mimulus Moschatus Harrisonii*. A new hybrid, named *Grandiflorus*, has large pure yellow flowers; and a variety of this has a very dwarf and compact growth, and has been named Cloth of Gold. A similar dwarf variety has deep brownish-red flowers, and has been named *rubrum*. All these new forms are very valuable, and retain the full musk scent.

Nierembergia.— This was named after T. E. Nieremberg, a Spanish Jesuit. It represents a genus of pretty half-hardy plants suited for flower beds and pot culture. *N. filicaulis*, the Thread-stemmed Nierembergia, is a native of Buenos Ayres, with lilac blossoms, and makes a pretty bedding plant, while it is also very effective in pots. *N. frutescens* is the Tall Nierembergia, a very elegant plant, of somewhat shrubby habit, but apt to be cut down by frosts in winter. It is a native of Chili. It should have a place on a warm border or bank, in perfectly drained light rich soil, where it will produce freely its delicate blue flowers. *N. rivularis* is the White Cup; it is a hardy perennial from La Plata, a dwarf plant with creeping, slender stems, forming a thick carpet of foliage, covered during summer with large erect flowers, of a creamy-white colour. It does best on rockwork, or on the margins of borders, in moist sandy loam.

Omphalodes (the *Blue Navelwort*).—*Omphalodes* comes from *omphalos*, "the navel"; and *eidos*, "like," referring to the seed. It is sometimes called the Creeping Forget-me-not, which is an admirable name for it, for the plant has a prostrate creeping growth, loving a moist, shady spot, and flowering freely in spring, the blossoms of the loveliest blue. It is a native of Spain and Portugal. We may say of this charming plant that it is a near relative of the Forget-me-nots, quite as beautiful, and on the whole more useful than any of them, because it is a true perennial, and with facility creeps about in shady places. It produces handsome, deep and

clear blue flowers with white throats, which are produced in early spring—say March and April. In the autumn it puts forth trailing shoots, which take root at the joints, whereby the plant is most plentifully propagated. When the plant is thoroughly established it blossoms freely. The species under notice is *Omphalodes verna*, which means "spring-flowering." *O. Lucillæ* is a seldom-seen and a very charming sister of the foregoing, but with a dwarf crop of very glaucous smooth leaves, and with flowers of bright sky-blue, having a faint stain of something akin to the palest lilac. It is a native of Mount Taurus. This plant is a little difficult to manage; it appears to do best in a raised and sloping position, such as the fissures of rockwork. Slugs are very fond of it, and eat its leaves greedily. Both species are delightful subjects.

Onosma.—This genus represents a group of hardy herbaceous perennials; the flowers tubularly bell-shaped, and in all cases yellow or yellowish. Onosma comes from *onos*, "an ass"; and *osme*, "smell"; the perfume of the plant, it is said, being grateful to that animal. *O. Taurica* is the Golden Drop, a native of the Caucasus, a pretty evergreen perennial, forming close compact tufts, composed of linear, lance-shaped foliage above six inches long, with tubular flowers, arranged in cymes of a bright yellow colour, and very fragrant; it is of dwarf growth, and makes a very showy border flower. *O. stellulata* is the Small-starred Hungarian Onosma, about twelve inches in height, and producing yellow blossoms; but the first-named is by far the most popular. It does best in a warm position, and in well-drained sandy loam.

Orobus (*Bitter Vetch*).—*Orobus* was the Grecian name of a Pea-like plant, and supposed to be derived from *oro*, "to excite"; and *bous*, "an ox"; the plant being nourishing food for cattle. The Bitter Vetch is supposed to represent the herb mentioned in a passage in Pulci, which relates how an enchanter preserves two knights from starvation, during a long journey, by giving them a herb which, being held in the mouth, answers all the purposes of food. This may refer to the common Bitter Vetch, *O. tuberosus*, a native perennial plant, flowering in May and June. The roots are creeping, swelling into tubers at irregular intervals. "The Highlanders of Scotland have a great partiality for them, and dry and chew them to give a greater relish to their whiskey; they also regard them as good against chest complaints, and say that by the use of them they are able to withstand hunger and thirst for a long time. In Breadalbane and Ross-shire, they sometimes bruise and steep them in water, and make an agreeable fermented liquor with them. They have a sweet taste, something like roots of Liquorice, and when boiled are well-flavoured and nutritive; and, in times of scarcity, have served as an article of food. When well boiled a fork will pass through them; and, slightly dried, they are roasted and served up in Holland and Flanders like Chestnuts" (Hogg's "Vegetable Kingdom"). Many think that the Bitter Vetch is the Chara mentioned by Cæsar as affording food to his famished soldiers at the siege of Dyrrhachium, and the above description makes it not improbable.

The species and varieties of *Orobus* are all hardy herbaceous perennials of moderate growth, and very free-flowering; the few most generally cultivated are: *O. Alpestris*, the Hungarian Rock Bitter Vetch, with purple flowers; *O. Lathyroides*, from Siberia, a showy species, producing, in early summer, numerous small blue flowers; *O. luteus*, the Yellow-flowered Bitter Vetch, from Siberia; *O. niger*, a British species, with dark purple flowers, and a very pretty border plant; *O. vernus*, the Spring Bitter Vetch, one of the most charming border flowers, that opens in early spring; when in good soil and doing well, from its black roots spring rich healthy tufts of leaves, with two or three pairs of shining leaflets, the flower-buds showing soon after the leaves, and eventually almost covering the plants with beautiful blooms, purple and blue, with red veins, the keel of the flower tinted with green, and the whole changing to blue. It is no fastidious Alpine beauty, that when carried to our gardens sickens and dies for want of the pure cool mountain air and moisture, but a vigorous native of Southern and Central Europe, well able to make the most of our warm, deep, sandy loams, and perfectly hardy everywhere. It flowers in April and May. Grows from ten to eighteen inches high. It is of easy culture in ordinary garden soil. *O. violaceus* is regarded as a variety of the foregoing.

Ourisia coccinea.—This is a very handsome creeping plant, having stems six to nine inches in height, bearing panicled clusters of scarlet Pentstemon-like flowers in summer. It is a native of Chili, and can be highly recommended for a moist shady border in leaf-mould and sand. It is a very showy and attractive subject.

Phygelius Capensis.—This is the Cape of Good Hope Phygelius, and it is a very effective hardy autumn-flowering plant, growing from one and a half to three feet in height, having pyramidal spikes of long tubular flowers, of a rich vermilion with a yellow throat. It is a very fine border plant, and does best on the south sides of houses, walls, &c.

It is generally rather tender, but thrives very freely in mild districts in light, sandy loam, or vegetable soil; in warmer countries it thrives on walls, and in stony or gravelly places. It is readily increased by division of the roots.

Physalis Alkekengi (*Winter Cherry*).—This is a perennial herbaceous plant, a native of Southern Europe; frequently found in gardens; producing round red berries, like Cherries, having an acidulous, slightly bitter, and not unpleasant flavour. It produces, in summer, dull white solitary flowers on slender stalks; it is a true perennial, and when once established on a warm position in light, sandy soil, will grow and fruit freely. It has an ornamental value in autumn and winter, when the berries are numerous and well-coloured.

Plumbago (*Leadwort*).—This genus derives its name from *plumbum*, "lead," or a disease of the eye so called, to which a species of Plumbago was applied. It is not a large genus, but comprises green-house and stove evergreen plants, and one or two hardy herbaceous types. With one of these only have we to deal—viz., *P. Larpentæ* (Lady Larpent's Plumbago), introduced from China in 1845. The late Sir William Hooker declared that it ought to be known as *Valoradia plumbaginoides*. It is a dwarf-growing herbaceous plant, originally cultivated in stoves and green-houses, but since found to be perfectly hardy, and a first-rate ornament for rockwork, banks, or sunny borders. "Its numerous wiry stems, covered regularly from top to bottom with light green leaves nearly two inches long, and margined with hairs, are half prostrate, but being very profuse, form neat and full tufts from six to ten inches high, according to soil and position. In September these become nearly covered with flowers arranged in close trusses at the end of shoots, and of a fine cobalt-blue, afterwards changing to violet, the calyces being of a reddish-violet. The bloom usually lasts till the frosts" (Robinson's "Alpine Flowers"). We have seen this plant do well on a raised bed in front of a green-house. It will sometimes do well in very cold soils, but it is in all cases desirable to give it a warm sandy loam, or other light soil, and a sunny warm position, as under these conditions the show of bloom is much finer. It is very easily increased by division of the root during winter or early spring.

Polygala (*Milkwort*).—The generic name is derived from the Greek *poly*, "much"; and *gala*, "milk"; the ancients considered it promoted the secretion. Its English name, Milkwort, refers to the same quality which suggested the generic name. The genus includes a few hardy annual and perennial plants, and a number of green-house evergreens. Our object is to introduce to notice a few desirable types among those in the hardy herbaceous section.

The common Milkwort, *P. vulgaris*, is a perennial common in gravelly and heathy pastures, flowering in June and July. It is one of the milky plants supposed by the ancients to increase and accumulate milk in nurses.

P. calcarea, a British species, is found in Kent, Surrey, Gloucester, Berks, &c., generally on chalky *débris*, very pretty, usually with blue, but sometimes with pink or whitish flowers, about a quarter of an inch long, in compact racemes. Plants taken from their native positions, where they seed and produce freely, very soon establish themselves in ordinary garden soil. *P. Chamæbuxus* is the Box-leaved Milkwort, a valuable little creeping shrub, a native of the Alps of Austria and Switzerland, where it often forms but very small plants; in our gardens, however, on peaty soil, and in some fine sandy loams it spreads out into compact tufts covered with cream-coloured and yellow flowers, afterwards changing to a bay colour in the lower division. It is stated that this plant was cultivated two hundred years ago at Oxford, but it is now comparatively rare in our gardens. It is a moisture-loving plant, and does well for association with dwarf Alpine shrubs on rockwork. It is a native of the Alps of Austria and Switzerland. It can be readily increased by division of established tufts. There is a fine variety of this named *purpurea*, which has magenta-purple blossoms, while those of the species are pale lemon or bright yellow, but in each case deliciously fragrant.

Pulmonaria (*Lungwort*).—The generic name is derived from *pulmonarius*, "diseased lungs," referring to its supposed efficacy in those diseases. It is also known as the Virginian Cowslip, Cowslip of Jerusalem, &c. All the Pulmonarias are hardy herbaceous perennials, propagated by dividing the roots, and they do well in any garden soil that will grow common plants. *P. officinalis* is a somewhat rare British plant, but often grown in gardens; the leaves are abundantly marked on the upper surface with white blotches; the flowers are at first rose, and then blue, on stems abundantly produced in spring. *P. arverensis* is a new form from the Central French Alps, and so distinct in appearance that it is regarded as a species; the leaves are deep green, slightly mottled; and the flowers are of an intense deep blue; it is found to do well in good garden loam. *P. angustifolia*, the Narrow-leaved Lungwort, is by some botanists united with *P. officinalis*, and there is a white and a spotless variety in cultivation. *P. azurea*

is of dwarf and compact growth, bearing dense heads of deep blue flowers; it is a native of Poland. *P. latifolia* has massive erect clusters of deep blue flowers in early spring. *P. saccharata* is the Sugared Lungwort of Europe; the flowers have been well described as of a shot-silk colour. *P. Siberica* is the Siberian Lungwort, with marbled foliage and deep blue flowers. *P. Virginica* is the Virginian Lungwort, and, like its predecessor, produces blue-coloured blossoms. We may say of all the forms of the Lungwort mentioned that they are very vigorous and hardy, thriving on any soil, and forming attractive clumps and beds in the spring garden.

Rheum (*Rhubarb*).—Our cultivated Rhubarbs of the present day may be regarded as improved varieties obtained from *R. rhaponticum*, *R. hybridum*, and others. But a few of the species are very fine hardy ornamental plants for summer use in the flower garden, and especially that portion known as the sub-tropical garden. *R. officinale* is a stately and very handsome ornamental foliage plant. *R. Emodi* is the Red-veined Rhubarb of Hungary, a noble herbaceous plant with very handsome foliage. *R. palmatum* makes a fine-leaved hardy plant; so does *R. podophyllum*. But they are suitable only for large gardens, their stately presence and handsome foliage contrasting well with other plants of smaller size and different character. They can be naturalised with great advantage in semi-wild places.

Saponaria (*Soapwort*).—The generic name is derived from *sapo*, "soap"; as the leaves of *S. officinalis*, the common British Soapwort, when bruised in water, form a lather like soap, and will take out grease-spots in a similar manner. The common name, Soapwort, is easily understood.

The genus comprises hardy herbaceous species and hardy annuals. Prominent among the former is *Saponaria cæspitosa*, a charming form from the Pyrenean Alps, producing Thrift-like tufts, one and a half to two inches high, bearing clusters of showy, vivid pink flowers, large, and very handsome. It is a plant that does well on the rockwork, planted in loam, leaf-soil, and sand. *S. Caucasica*, the Caucasian Soapwort, produces heads of pink flowers like a Phlox; and a double form of this makes a capital border plant. *S. ocymoides* is one of the best known and most useful among the perennial types; it is called the Rock Soapwort, a beautiful trailing rock plant, with prostrate stems, and an abundance of rosy flowers, so densely produced as to completely cover the cushions of leaves and branches. It is easily raised from seed or from cuttings, thrives in almost any soil, and is one of the most valuable plants we have for clothing the most arid parts of rockwork, particularly in positions where a drooping plant is desired, the shoots falling profusely over the face of the rocks, and becoming masses of rosy bloom in early summer; and also excellent for planting on ruins and old walls, on which the seed should be sown in mossy chinks, or spots where a little soil has been gathered. It is also a valuable border plant, forming roundish spreading cushions, with masses of flowers, and is well worthy of being naturalised in bare and rocky places. It is a native of Southern and Central Europe. The common Soapwort, *S. officinalis*, is a stout and showy perennial, and makes a good border plant, producing flesh-coloured or rosy flowers.

Of the annual Soapworts, the best known are *S. Calabrica*, from Calabria, and its white-margined and rose-coloured varieties. The Calabrian Soapwort is one of the longest blooming of our hardy annuals, producing masses of minute cross-shaped rose-coloured blossoms on a light and graceful leaf ground; and if seeds be sown in July or August, it makes a good spring-blooming plant. The pink and white varieties are most effective grown in groups, small beds, or lines—in contrast. Sown in the autumn, they may be had in bloom, on light soils and in warm, cosy places, in April. Sown again in the spring, they bloom in July, and will continue to flower throughout the autumn, being far less fugitive than most annuals. *S. pumila rosea*, and *S. pumila alba*, are dwarf, Alpine, hardy annuals; very pretty and distinct.

Tradescantia (*Spiderwort*).—This genus was named after J. Tradescant, gardener to Charles I., and the common name Spiderwort is derived through *T. Virginica* being used in Jamaica as a remedy against the bites of venomous spiders. The genus includes hardy annuals and hardy herbaceous species, and their varieties; also green-house and stove herbaceous plants; but it is the second of these, the hardy herbaceous, that we have to do with here.

The one particularly worthy of notice is *T. Virginica*, the Virginian Spiderwort, introduced from North America in 1629. *T. Virginica* is a distinct and valuable perennial, flowering in summer abundantly and continuously; the flowers deep violet-blue, with yellow anthers, arranged in umbels on the tops of the stem and branches. There are several varieties of this—white, red, double red, rose, light blue, and deep violet; all of them form erect bushes eighteen inches in height. It is a most useful and handsome decorative plant, and very accommodating also, as it succeeds in the wettest of clays, as well as in any ordinary garden soil. *T. Virginica* should find a place in a selection of choice hardy plants.

SMALL AND BUSH FRUITS.

By D. T. Fish, assisted by William Carmichael.

THE STRAWBERRY.

OUR present race of Strawberries are the cultured products of the native and other species of *Fragaria*. Few fruits have been more improved by cross-breeding, selection, and evolution; and yet, so long as those processes were confined to native species, little was effected but an enlargement of size in Wood and Alpine Strawberries, or *Hautbois*. So early as the beginning of the sixteenth century we read of the former being developed to the size of Mulberries, a development unknown to modern cultivators of the same species. It was not, however, until the introduction of *Fragaria Chiliensis*, *F. grandiflora*, and *F. Virginica*, that our present families of Pine and Scarlet Strawberries began to be moulded into their present quality and form. Some of these can now also claim a very respectable antiquity. The Old Scarlet has been grown in its present form for two centuries; the Roseberry or Gravesend Scarlet for at least a hundred years. Keen's Seedling was raised in 1820, and thirty years later the Black Prince, Elton Pine, and Myatt's Eleanor, and many others still in cultivation—the near progenitors of such fine varieties as British Queen, President, and a host of others.

Considering that white varieties have existed from the earliest times, it seems singular that so few have been or are cultivated. A White Alpine and the White Carolina were extensively grown, and have been improved out of the garden by the Bicton Pine, a delicious white variety, well worth cultivating. Possibly some of these may have infused some of their white blood into such delicately-tinted sorts as British Queen, Dr. Hogg, &c. But good white Strawberries are rare, and can hardly be said to be popular.

There is, probably, more money made in Strawberries than in any other hardy open-air fruit. As much as twenty pounds profit per acre has frequently been cleared from Strawberries, and it is no uncommon thing to hear of an acre of Strawberries being worth one hundred pounds. Though a perishable crop, if picked and packed with care it travels safely by rail, and the smaller fruit can be made into jam on the spot, or transported in tubs to the large preserving houses. Picked fruit gathered overnight, and delivered in London or other large towns by the milk trains, generally commands a price of sixpence or more per pound.

Thoroughly preparing the ground, manuring and planting, costs about twenty pounds per acre; but the crop may remain three or more years on the ground without any great additional expense, and it would be difficult to name any other fruit that will yield larger gross returns, and such liberal profits.

The forcing of Strawberries also opens out an almost new and a profitable industry. Ripe fruit in March commands prices varying from sixpence to two shillings per ounce. In the Royal Gardens of Frogmore about one hundred thousand pots of Strawberries are forced annually, and some commercial growers probably double or treble these numbers.

The Propagation of the Strawberry.— Practically, there is but one mode of propagation, by runners; but division and seeds are occasionally employed. The best time to propagate Strawberries by division is August, or early in September; the worst is the late spring. Every one must have noticed that each so-called Strawberry plant, after a year or two's growth, is really a bunch or tuft of plants consisting of several or many crowns. It follows that if these are lifted the plant may generally, with careful manipulation, be converted into as many plants as there are crowns. The vital points in the matter are to see that each crown has roots belonging to it intact, and that the root-stocks, connecting root and crown, are not seriously injured. Then plant at once, only leaving the crown out of the ground, and pressing the earth very firmly against the roots and root-stock. This mode of propagation succeeds best in rather light and warm soils, but it is not to be recommended unless the scarcity or absence of runners compels its adoption, as the plants are apt to perish or stand still under such severe manipulations.

Propagation by Seeds. — Some varieties, or semi-species, such as the Old Wood or Alpine Strawberry, are said to thrive best, and fruit most freely, raised from seeds. The writer cannot endorse this view. Alpines are so prolific of runners, and the plants are often so much crowded together, that the runners are thus smothered into weakness, and take a long while to grow into strength after removal from the plants. Hence, thinly sown and carefully fostered seedlings would, doubtless, prove better than such starveling runners. By planting Alpines thinly, and selecting the strongest runners, they will beat seedlings in vigour of growth, and assuredly equal or excel them in fertility. But many elect to raise their Alpines from seeds, and there is no other mode of obtaining new and improved varieties.

Select the finest fruits, whether of Alpines or others, cut them in half, and eat or remove as much of the centre pulp as may be, without losing the seeds, which are on the exterior surface. Then care-

fully squash the fruit in water and remove the pulp and all seeds that float on the surface. This is rather a tedious process, and when completed remove the water and spread the heavy seeds on sheets of paper to dry in the sun, or at a gentle fire, and either sow at once or the following spring. When the object is to obtain improved and new sorts, two distinct varieties should be crossed.

The seeds may be sown in the open air in March or April. The soil can hardly be too light, fine, and rich; and the warmer and sunnier the situation, the sooner the plants appear. Sow in very flat drills about six inches apart, or on prepared beds, and cover with a mere sprinkling of very fine soil. The seeds, which are very small, can hardly be sown too thinly, and will be up in a month or six weeks. As soon as they have made from three to five leaves, plant them out singly from three to six inches apart. The seed beds, as well as the young seedlings, must be watered should the weather prove exceptionally dry. Properly attended to, the seedlings will bear the following season.

But the seedlings will be much stronger before the winter if sown in a gentle heat in February, transplanted on to a slight hot-bed so soon as sufficiently large, and planted out in their future quarters towards the end of May, or early in June. Alpines treated thus will fruit in the first autumn from sowing, and other varieties yield a fair crop the second season. No runners must be permitted to grow on the seedlings, as these tend to enfeeble and injure the crown.

Propagation by Runners.—The name of runners is most appropriate and truly descriptive. As the fruit approaches maturity the main energy of the Strawberry plant is directed to multiply itself. For this purpose it puts forth a crop of runners from the base. These consist of a flexible stem furnished with a bud or embryo plant on its crown. After diverging from the root-stock at right angles, to a distance of from one to three inches, these buds or plants strike root in the soil if that should be moist and rich enough to tempt them into doing so. If space and other conditions are suitable, the newly-rooted runner repeats the process of sending out another runner, and so on and on in succession; and thus one Strawberry plant might cover a rod, a rood, an acre. But the cultivator arrests the process at the first runner, concentrating the vital force capable of making many plants, into the maturing of one. This is easily done by stopping the runner beyond its first bud.

An early crop of runners is the key to success in Strawberry-growing. Late and weakly runners waste time, as well as diminish weight of produce. One of the surest means of having a full crop of runners, is to make fresh plantations of these every year so soon as they are rooted. Young plants produce runners earlier than older ones. This arises, doubtless, from their youthful vigour, as well as their scantier crops of fruit. Indeed, where large supplies of early runners for forcing or other purposes are desired, it is good practice to nip out the bloom from a few rows of young plants, and thus force their entire strength into runner-growing.

Another capital mode of accelerating the growth of runners, is to plant out the forced Strawberries so soon as their crops under glass are gathered. These will frequently produce a crop of fruit, and also of runners, in the autumn. If one plant is left on each runner, that will grow into great strength next summer, before the runners on the open-air crops have made a start. Liberal top-dressings annually; heavy waterings of sewage or clear water in dry weather; special dressings so soon as the fruit is gathered, or, better still, a month before; placing a stone on each runner, or pressing it closely down, and stopping its further progress beyond the first bud; layering the runner in a pot filled with rich soil or manure — are some of the most successful of the many expedients adopted to facilitate the early production and liberal culture of runners during the earlier stages.

So soon as thoroughly rooted, the runners should be detached from the parent plants, and either planted out into nursery beds or permanent quarters, or potted into their fruiting-pots at once. More evil is wrought in the interregnum that mostly occurs after detachment than can be made good by any amount of after-care and culture.

Planting.—Almost any good garden soil will grow Strawberries. In very thin dry soils on gravel, however, the plants suffer severely from continuous drought in hot dry seasons. Soils on wet bottoms are, on the other hand, fruitful of mildew. Loams of most sorts, from light and sandy to what are known as sound holding, are best for Strawberries. Stiff soils, especially if at all wet, are unsuitable. Holding loams give less leaf and produce heavier crops than lighter and more mixed soils. Old black garden soils, however, often produce much foliage, and also enormous crops of fruit. Heavy soils can be worked up into Strawberry ones by admixtures of peat, light manures, sand, or burnt earth, while any light soils can be greatly improved by dressings of marl and stiff loam, approaching to clay. The depth should not be less than from thirty inches to three feet.

Manuring and Mixing of the Soil.—The more manure the better the crop, is the short and ready

answer of some growers; and this may hold good on poor hungry soils. But on sound rich loams, manure should be employed with caution. If too rich, or used in excess, leaves rather than fruit will be the product. A heavy dressing of farm-yard manure thoroughly incorporated with the soil is the best preparation for Strawberry culture. The soil should also be well mixed together as well as thus liberally enriched—tops and bottoms, as well as the middle of the tilth, all well incorporated into a homogeneous mass of about uniform quality.

Time and Distance to Plant. — So soon as well-rooted runners can be obtained is the best season—say early in July. The earth is then warm, and the plants root with extraordinary vigour and rapidity, and get thoroughly established before the winter. But if crops cannot be cleared off so early, the runners may be nursed out as already described, and permanently planted out so soon as practicable. Some even prefer planting out the permanent crops in the spring, in February and March.

Scarlet, Alpine, and other of the smaller-leaved Strawberries yield excellent crops in beds. The latter, three or four feet wide, were filled with plants at distances varying from nine to eighteen inches apart, and frequently allowed to become much closer through the rooting of runners after the first year. Alleys or spaces, two or more feet wide, were left between the beds for gathering and culture.

But bed culture has now given place to drill or row; the distance between these ranging from eighteen inches to three feet, according to the character of the soil, and of the varieties grown. From two feet to thirty inches are the distances most generally adopted. The distances between the plants may range from fifteen inches to two feet, eighteen inches being a good average.

Some plant as thick again as needful, gather a first crop, and then remove every other row, and re-plant where removed to form fresh plantations. Others practise a sort of dual culture of Strawberries and other crops. For example, Onions are sown in drills thirty inches apart, the vacant space being kept clear of weeds and well cultivated, and planted with a row of Strawberries so soon as the runners are ready. These will make good and rapid progress, and by the time the Onions are harvested, will have furnished the ground. Excellent crops are gathered the following season, alike of early runners and good fruit, and Onions and Strawberries both gain by thus running these two seemingly incongruous crops abreast.

Plant all rooted runners with a trowel, and transfer them to their new quarters with a ball of earth and roots intact. A drill two inches deep facilitates the planting considerably. Plant deeply right up to the base of the crown, and press the soil firmly round the latter and the roots generally. Should dry weather prevail or immediately succeed, water freely to keep the leaves stiff and the roots in active motion. To allow a Strawberry plant to flag once during its growing period, is to lose time as well as sacrifice produce. Promptly suppress the production of runners on the young plants, and keep the surface soil loose and free from weeds, and thus complete the culture of runners for the first season.

General Culture.—A firm tilth with a loose surface is the beau-ideal of earth-condition for the Strawberry. It bothers all insect pests, preserves the earth sweet, cool and moist, and favours fertility rather than leaf-growth; unless during the period of ripe fruit, it is good practice to keep the Dutch hoe skimming the surface soil. Some add dressings of rich compost or manure annually. These are useful on thin, hungry, hot soils, and are best applied soon after the crops are gathered, or shortly before the plants bloom.

Mulches.—These mostly perform the compound functions of feeding the plants and forming a clean bed for the ripe fruit. The best is formed of long stable or farm-yard litter placed between the rows in March or April, or even earlier. The rain washes down the soluble manure, and leaves the strawy substance sufficiently clean to protect the fruit from earth-splashings. Such mulches also preserve the moisture of the earth and keep it cool.

Watering.—From the time the plants show flower, till the fruit changes colour, the roots must not once suffer from drought. Delugings of sewage or clean water should be given every other day if needful.

Gathering the Fruit.—The sizes should be sorted as gathered, into two or even three qualities, to make the largest profit; all the best gathered with their husks for dessert, and packed separately in small punnets, and the others without husks for preserving. Great care should also be taken not to bruise or break the stalks of the fruit left, nor trample on the crowns or leaves of the plants.

Removal of Runners and Leaves.—All runners not needed for propagation should be removed, and the permanent crops should be gone over two or three times during the season for this purpose. As to the removal of the leaves in the autumn, volumes have been written for and against the practice. As a rule it is safest to leave them

intact. But in the Southern counties, where Strawberry plants ripen their crops and mature their foliage early, great success has been reached by cutting off the old leaves soon after the gathering of the fruit. Large heads of fresh leaves are soon produced, with a corresponding crop of plump crowns, that mature well before winter, and yield splendid crops the following season. The practice, when adopted, must be carried out with care, and only the old leaves removed. Nothing could well be worse form in Strawberry culture than the mowing of all leaves off with scythes, as was frequently done in olden times. This, and the digging between the rows with spades, has now happily disappeared. Where the plan of defoliation is practised it should be followed by top-dressings and liberal waterings, should the soil be at all dry, thin, or poor.

Durability of Plantations.—Great diversity of opinion prevails on this point, and the tendency of modern cultivation is towards frequent renewal, say every three years. On good soils, however, and under liberal culture, the plantations may remain for four or six years. Those who adopt the practice of planting out their forced Strawberry plants seldom leave them more than two years. These bear well the first season, and enormously the second, and as abundance of plants are mostly at hand, they are dug down after their second crop in the open. Strawberries are also more used in courses of rotation than they used to be, and hence their more frequent renewal. Besides, young plants produce the finer fruit, though older plantations, under liberal treatment, often yield a heavier gross crop for preserving.

Special Culture of the Strawberry.—No fruit is more amenable to special culture than the Strawberry. Its small size, early maturity, and abundant fertility lend themselves readily to special culture and forcing. The plants may be grown from runners into fruitful plants within the limit of little more than three or four months. And Strawberries can be grown with more or less success anywhere or everywhere. In window boxes, on balconies, roofs, or areas, and in the smallest town, suburban, or rural garden, the Strawberry may be made to bloom and ripen its luscious fruits. Fortunately Strawberry plants, with plump crowns almost bursting into embryo fruitage, may be purchased at a cheap rate from many growers for sale, and these can be ripened under conditions that would hardly have brought them into such a promising state.

Strawberries on Banks.—Some of the finest, as well as the earliest, Strawberries ever seen by the writer were grown on a sloping bank with a southern aspect. On such banks, unless the soil is abnormally rich and deep, the plants are apt to suffer from excessive heat and drought. To prevent this, and insure to the plants the full benefit of artificial watering, ground stages are formed. These consist of level spaces varying from eighteen inches to three feet broad, separated from each other by a series of steps, of a depth of a foot or more. These spaces are virtually the shelves of an earth stage, the steps being the risers between the same. To insure the full use of the water given, the shelves should incline inwards, not outwards. The narrow shelves are furnished with one row of plants, the wider ones with two or more. The chief drawback to these earth stages is their tendency to crumble down and lose their distinctive character. Where spoilt brick, stone, or other hard refuse is plentiful, the use of these checks the crumbling, and the rough rockery for Strawberry culture may be so constructed as to stand securely for years.

Means of Prolonging the Season.—The simplest of these consists in planting early, late, and mid-season Strawberries on south, north, and all other possible aspects. For example, Black Prince on a south border, to foster its precocity to the utmost; Keen's Seedling on a west aspect; British Queen on an eastern, and Elton or Late Pine on northern sites. Another simple method of altering the Strawberry season is to pick off all the early blossoms so soon as the embyro spathes can be descried. This practice is most successfully applied to forced plants. Their abnormal vigour, especially under high culture, will force a second crop of bloom late in the season. Probably the most certain mode of insuring a really good crop in the late autumn is to plant out the earliest forced plants, so soon as the fruit are gathered, in rich soil, and liberally supply them with water, so that they never once suffer nor flag. These, and especially such popular sorts as Black Prince, Keen's Seedling, Vicomte Hericart de Thury, and President, often yield a full crop through August, September, and October, the succession of ripe fruit lasting much longer than in the normal season of Strawberries.

Forcing.—A great deal may be done to hasten the ripening of Strawberries in the open air by placing Rendle's protectors, ground Vineries, small frames, or common handlights, over the plants on south borders, or raised banks. A month may thus be gained in the time of ripening. In the use of glass fostering expedients it must, however, be borne in mind that air must be given during bright sunshine to prevent any excess of heat or scalding. But such use of glass brings us to the next and the most important and

best-paying of all the branches of Strawberry culture—that of forcing. By subjecting Strawberries to heat in November, ripe fruit may be gathered in February, and thus by the combined agencies of special culture and forcing the plants, their delicious fruit may be enjoyed for eight months out of the twelve. Special culture and suggestions for retarding and prolonging the fruiting season have been placed first in this article, inasmuch as they are generally neglected or unknown, whereas most amateurs dabble more or less deeply in Strawberry forcing. To these, the caution may be added here, not to attempt it too early in the season. Starting with the new year they may succeed, with little loss of plants, in having a fair crop ripe in March. Earlier, the loss of plants through imperfect setting may reach cent. per cent. Success is possible but difficult in February, easier in March, child's play in April, achieved with little effort in May. The other conditions of success may be summarised thus: good plants, slow progress at first, careful setting, liberal feeding, abundant supplies of water, light, and air.

Strength and maturity of crown, and a prodigal profusion of roots, are the chief factors in the making of what are called good plants. Early runners layered as soon as possible in pots filled with rich soil, and then immediately shifted as soon as rooted into six-inch pots, grown on in the full light of the sun, and never once allowed to flag until their growth is completed, are sure to result in good plants. One plant in the centre of a six-inch pot produces the best results. Part of an oyster-shell over the pot, with an inch of smashed bones over this, and a dash of soot over all, completes a feeding and anti-worm drainage. Almost any good garden soil will grow Strawberries in pots; the best of all being a rich calcareous loam, enriched with about one part to six of rich well-rotted manure. A little old lime rubbish added to ordinary loams proves most useful. A few lumps of the roughest portions of the soil should be placed over the drainage. The soil can hardly be made too firm in the pots and around the plants. The plants should be placed on a hard base, and be moved frequently to prevent their rooting through, as such roots must needs perish afterwards.

As the end of the growing season advances water must be partially withdrawn, the pots being turned on their sides during heavy rains; the great object being to mature the crowns, and have the soil in the pots tolerably dry before winter. If properly managed the roots should be so numerous and strong as to fill the pots almost to bursting. Finally, the plants should be protected from frost, either by storing in cool houses, pits or frames, or by being mulched over, or built up on their sides, packed firmly and protected with litter. From such frost-proof and tolerably dry storing quarters the plants may be taken in batches of fifty, a hundred, or five hundred into the forcing-houses or pits, as required.

A Slow Start.—The Strawberry being a hardy plant, if taken from the open air into a hot-house, leaves and flowers will be pushed forth with a rush, and hardly any fruit will set or swell. The best mode of starting Strawberries is in a pit with a mild bottom heat derived from fermenting leaves. Plunge the pots to the brim in these and give abundance of air, or even draw the lights off should the weather be mild. By thus keeping the heads of the plants cool and the roots warm, the latter will get a good start of the former. So soon as the plants show bloom, or even before, remove them to a shelf or stage in a light house, with a temperature of 50° to 55°, which should not be exceeded with artificial heat until the bloom is set. If grown on in the pit they should be raised close to the glass, though the vapour from fermenting materials is rather a hindrance than a help to the setting of Strawberry blooms. A slow start is of equal, or more, importance if the bottom heat is not applied, and the plants are placed on shelves or stages at once.

Careful Setting.—All the earlier crops should be artificially impregnated by the use of the camel's-hair pencil on the blooms every day the blossoms continue open. Full exposure to light, and as much air as can be given with safety, also impart buoyancy to the pollen, and assure the safe setting of the fruit. Should sunny weather prevail a good set is tolerably certain, but in dull weather extra heat may be used to dry the atmosphere, and much more air be given.

Liberal Feeding.—The area of pots being very limited, it is important that the roots be well supplied with food. The simplest means of doing this is by top-dressings of solid and plentiful applications of liquid manure. Soot and guano-water, an ounce or so to a gallon, and house drainage, are among the best foods for Strawberries in pots. Some place the pots in a second one half filled with rotten dung, or in boxes, or on shelves, partly furnished or covered with turves of rich soil, inverted on layers of dung. These often prove useful, and produce fruit of enormous size and the highest quality. From the start to the finish forced Strawberries must never once flag for lack of water. During hot dry weather, with the plants placed near to the roof, and the temperature ranging from 65° to 70°, during the ripening

periods it may be needful to water the plants three times in the course of the day.

Light and Air.—It is impossible to exaggerate the importance of these to success in forcing the Strawberries. They are the very life of the plants and of the fruit, as well as their flavour. So soon as the fruit begins to colour air must be admitted freely, even should it necessitate a fall of temperature to 60° or so. That is, in fact, a good ripening mean for the filling of the fruit with flavour.

Other minutiæ of successful forcing consist in the tying up of the fruit-spathes, the thinning of the same to from three to six of the finest fruit on each, by the removal of all the smaller ones; the introduction of fresh batches of plants in succession every three weeks or so to keep up the supply; the careful gathering of the ripe fruit with husks attached in the early morning, or some hours before it is wanted; and the storing of it in a cool place; the withholding of manure-water so soon as the fruit changes colour; the removal of all runners so soon as they reveal their presence, the removal of weeds, the prevention and destruction of all insect pests, and the immediate removal of the plants to the open air directly the chief crops are gathered. Several sorts of Strawberries, and some few among all varieties, occasionally reveal a tendency to continuous fruiting. But such fruits are seldom worth the space occupied, and the better rule is boldly to clear out the plants, as already indicated, and fill the space at once with advancing crops.

Diseases and Insects.—Under favourable conditions the Strawberry may be said to be disease-proof. Occasionally, however, mildew, a species of rust, or fungous pest, appears. Overhead dressings of equal portions of lime, soot, and sulphur are the most effective palliatives. But an entire change of site and soil, and a fresh start with young, clean, vigorous plants, are the only cures or preventatives. All extremes of drought or moisture should be avoided. A good deal may also be done towards insuring success by selecting varieties suitable to localities. For example, in many portions of East Anglia the British Queen proves a bad grower and poor cropper, though the self-same variety thrives well within view of perpetual snow in Inverness and Aberdeenshire. Other varieties have their thriving and failing localities, which should be carefully noted before attempting culture on a large scale.

In certain places sterility prevails to such an extent as to assume the form of a disease; the plants grow freely, bloom profusely, but fail to set or swell their fruit. Such failures have been attributed to sexual and other causes, but they are mostly climatal, or cultural. The frost blackens the flowers, or the heat and drought wither them up, or the plants are badly mated to special localities, and the crops fail. Very frequently a thorough soaking with water just before blooming will cure sterility. A starving rather than a forcing regimen is not seldom an equally effective remedy for the same fault or disease.

Insects and other pests in great numbers and force prey upon the plants and ripe fruits. Slugs and snails of all sorts and sizes, red spider, thrip, aphides, ants, beetles, grubs, mice, rats, squirrels, birds, abound on the plants, or devour the fruit. The third, fourth, and fifth of these pests are seldom very destructive out of doors, unless in poor thin soils, and hot dry seasons, but indoors they are frequently troublesome. The usual remedies of fumigation, over-head syringing with tobacco, soot, or sulphide of potassium, in solution, will mostly clear the plants of such pests. Lime and soot are the sure destroyers of slugs and snails, while heavy top-dressings of spent tan, barley chaff, &c., are very serviceable. These and similar applications are also useful antidotes to the attack of the grubs of the spotted garden gnat, *Tipula maculosa*, that frequently gnaw off the flower-stems level with the ground, and other larvæ that prey upon the roots. When such appear, however, the safest means of vanquishing them is to find a fresh site for the Strawberries, and start with fresh plants, trenching the old beds down deeply, thus making an end of plants and larvæ.

As for rodents and birds, they must be trapped or netted out, or otherwise they make short work of ripe Strawberries, not only through what they consume, but by the far greater quantities they destroy.

Varieties.—These are very numerous, and are constantly being added to. Such varieties as the Hautbois partake of the character of a new fruit rather than a different variety, the flavour being perfectly distinct from that of all the other sorts. In securing these it is needful to stipulate that the plants are from fruitful strains, as it has been held that some are mostly male-flowering and fruitless, and others female. But the difference lies very much in the culture.

The Black Strawberry, or Downton, is one of the darkest of all Strawberries, and is useful alike for dessert and preserving.

A new autumn-fruiting species has been introduced, *Fragaria tardissima*, possessing the valuable property of ripening through August and September. The fruit is of fair size and quality. But possibly if intercrossed with existing varieties the result may originate a race of autumnal-ripening Strawberries, that will prove equally or more valuable than those

of autumnal-bearing Raspberries. The so-called Perpetual Pines, Hautbois, and Alpines might also prove useful in extending the season of ripe Strawberries further into the autumn.

In the following lists Mr. Carmichael's dozen and a half will be supplemented with other sorts of sterling merit, old and new, so that amateurs, as well as larger growers, can have no difficulty in making a useful selection.

Select List of Strawberries.

Alpine—red and white.
Auguste Boisselot—fruit very large, oval, richly flavoured, colour a deep red; plant hardy and prolific.
British Queen—fruit large, highly flavoured, and greatly esteemed, but requires good cultivation.
The Countess—fruit large, deep crimson; flesh solid, highly perfumed, and richly flavoured; it bears freely.
Dr. Hogg—fruit very large, with the British Queen flavour, a first-rate variety. It requires careful cultivation.
Hammonia—fruit large and handsome, glossy, orange-red; flesh white, solid, sweet and luscious; a fine late variety.
Keen's Seedling—a well-known variety, still valuable for preserving.
La Grosse Sucrée—fruit medium-sized, glossy dark red, flavour excellent, also a valuable variety for early forcing.
Lord Napier—fruit large and handsome, bright crimson, richly flavoured, and highly perfumed; fine, late.
Loxford Hall Seedling—fruit large, conical; skin bright crimson; flesh firm, juicy, and exquisitely flavoured; a fine variety.
McMahon—fruit very large, glossy, vermilion; flesh solid, and of exquisite flavour; and a free bearer.
Mr. Radcliffe—fruit large and handsome, of British Queen flavour, but is more hardy, and bears freely.
President—fruit large and handsome, deep crimson, and highly flavoured. The plant is a great bearer, and hardy.
President Delacour—fruit large, heart-shaped, colour bright orange-scarlet, flavour excellent; one of the best varieties.
Royal Hautbois—fruit small, peculiar flavour, and much esteemed by many. Plant free-bearing.
Sir Charles Napier—fruit large, of a bright scarlet colour; flesh firm, solid, and briskly flavoured; a favourite variety.
Sir Joseph Paxton—fruit large and very handsome; flesh solid, and richly flavoured; one of the best and most useful varieties.
Vicomtesse Hericart de Thury—fruit medium size, bright red, and richly flavoured; a most abundant bearer.

Supplementary List of Strawberries.

Admiral Dundas—very large, irregular, a pale scarlet, firm, juicy, excellent.
Alexandra—Immense size, flattish, orange-red, high-flavoured.
Alpha—early, something of the quality of Black Prince, but much larger, good flavour.
Amateur—very large, cock's-comb form, bright crimson; fruits ripen in succession.
Bicton Pine—sometimes called Virgin Queen—is without doubt the best white Strawberry grown; tender flesh and a rich flavour.
Black Prince—dark red, glossy, as if varnished, very early, and enormously prolific.
The Captain—a fine large Strawberry with a strong tendency to yield a second crop in the autumn.
Carolina Superba—large and fine, equal in flavour to British Queen, and a more sure cropper.
Compte de Paris—large, heart-shaped, deep crimson, brisk flavour.
Crimson Queen—late, prolific, large, bright red, good.
Deptford Pine—large, cock's-comb, bright red throughout, excellent for preserving.
Duc de Malakoff—large, good, richly flavoured, capital for forcing.
Duke of Edinburgh—large, irregular, red, juicy. This is known in the trade as Moffat's variety.
Early Prolific—something of the character and quality of Black Prince, but larger.
Eclipse—large, irregular, glossy red, good for forcing.
Eleanor—large, handsome, deep crimson, good.
Elton Pine—still about the very best late Strawberry in cultivation, large, crimson, sub-acid.
Filbert Pine—hardy, prolific, rich flavour, almost equals British Queen, and thrives in light soil.
Forman's Excelsior—similar and almost superior to President.
Globe—this is almost the only large variety with distinct infusion of the unique flavour of the Hautbois.
Ingram's Prince of Wales and Prince Arthur are two first-rate varieties for out of doors and forcing.
James Veitch—large, fine, mid-season variety.
King of the Earlies—rich flavour, good, and the earliest of all the Strawberries.
Kitley's Goliath—larger and almost equal in flavour to British Queen, excellent.
La Constante—bright crimson, good for forcing and out of doors, produces free runners.
Mammoth—immense size, scarlet, rich flavour.
Marguerite—equal or superior in size to the above, light orange, sweet and sugary.
Myatt's Eliza—the highest-flavoured of all, a good bearer, either in the open or forced.
Oscar—one of the fine sorts, with red flesh throughout, very dark, fertile, and of good flavour.
Princess Frederick William—pale red, highly perfumed, good flavour.
Princess of Wales—large, early, rich Pine flavour.
Princess Royal of England—very fertile, good habit, excellent for general culture.
Sir Harry—one of the best and most popular of market sorts, larger than Keen's Seedling.
Sir John Falstaff—immense size, conical or flattened, good flavour.
Trollope's Victoria—large, round, light crimson, capital bearer.
Wilmot's Prince Arthur—medium-sized, deep red, glossy, firm flesh, forces and carries well.
Wonderful—large, cock's-comb-shaped, pale red, sweet, juicy, and forces well.

PROPAGATION.

GRAFTING AND BUDDING.

By John Fraser.

GRAFTING is the mere act of uniting two cut surfaces of a plant, so as to cause them to unite. The art of grafting was known to the ancients, though no record concerning its origin is extant. From the ancient classical writers it is obvious that very little was practically known to them about the subject, of which they theorised or speculated rather loosely. The mere mechanical act of the operator, however skilful, is not always sufficient to insure a union. For instance, two plants of the same variety or species can be successfully grafted, as a rule; but there are numerous exceptions. Plants belonging to different genera have been grafted, and probably this is the extreme limit of relationship, beyond which no union can be effected.

Grafting is chiefly confined to exogens, whose stems, if more than of annual or biennial duration, are increased in thickness by one additional layer of wood annually in temperate countries, and sometimes two in tropical climates. Herbaceous stems may also be grafted when in active growth, but this is not much practised. Tuberous roots and stems of such subjects as Dahlias and Potatoes are sometimes grafted for the purpose of obtaining new

varieties by what is termed "graft hybridisation." Herbaceous grafting of resinous trees is also performed, when the shoots are making their growth and still quite soft. The stems of these exogens, otherwise dicotyledonous plants, and gymnosperms, such as the Conifers, may be roughly divided into pith, wood, and bark. Between the wood and the bark is a thin layer of tissue, consisting of thin-walled cells in their primitive, simple, undifferentiated condition, filled with formative or constructive material. These, in plants that periodically increase in bulk by additional concentric rings, retain, as long as the life of the plant continues, their power of growth and division, adding at each separate growth fresh wood to the inside, and fresh bark to the outside. Hence, the youngest wood is on the outside or circumference of the stem, while the youngest bark is on the inside of this tissue, and next to the formative layer just mentioned, and best known as cambium.

Endogens or monocotyledons are differently constructed; their stems are not separable into pith, wood, and bark. The external surface of some Palms and tree *Liliaceæ* appears to be invested with a layer of bark, but this roughened exterior is merely caused by the degradation of the ordinary tissue of the stems. The outer or circumferential tissues are usually much harder than the inner, and this gave rise to the opinion formerly entertained that the oldest wood was outermost, and that growth proceeded from the circumference towards the centre; hence, the application of the term "endogen." This, however, is no longer believed. The wood, instead of forming annual concentric rings, forms isolated fibro-vascular bundles, scattered through the ground tissue, while the hardness of the outer portion of the stem is caused by a denser arrangement of the respective bundles there.

Now, the fundamental principle of the whole system of grafting consists in placing and keeping the cambium layer of the two cut surfaces so closely together as to favour their union when they make fresh growth. The cut surfaces of the wood merely remain in contact, and no union takes place beyond the cambium. There is no cambium layer in endogens, and hence the impracticability or greater difficulty of grafting them.

Various objects are aimed at in grafting, but the main one is simply a practicable, convenient, and profitable means of propagation. Many things are difficult to propagate except by grafting, such as some of the Clematis and Azaleas, and these can be worked on the roots or stocks of a commoner sort, more readily obtained by other methods. Another important object gained is the modification of the scion or graft by the influence of the stock. For instance, in deep heavy soils, it is advantageous to cultivate shallow-rooting trees, to avoid the evil effects of a cold, wet bottom. In the case of the Pear, this is managed by grafting on the Quince, which is shallow-rooted, and at the same time a less vigorous grower, thereby exercising a dwarfing influence on the scion. Not only is coarse and excessive woody growth restrained, but an earlier fruiting tendency is induced, resulting frequently in larger, better-coloured fruit. Various other results and modifications are effected by grafting, which will be best noticed under the respective subjects.

One important point must not be overlooked in the relation of stock to graft. The mere union of plants belonging to different species or genera seldom affects either in any appreciable degree; so that in the case of a Peach grafted on the Plum, all above the point of union will be Peach-wood, and all below this, Plum-wood. These relations will remain constant, even if tested after any lapse of time. There may be a few remarkable exceptions to this rule, of which *Cytisus Adami* may be cited as a familiar and well-known example. It is now generally believed to be a graft hybrid, obtained by inserting a bud of *C. purpureus* on *C. laburnum*. The result is an individual intermediate between the two parents, and which occasionally reverts to either parent on different branches of the same tree. In the relations of stock to graft, generally, it will be the cultivator's aim to prevent undergrowth, or suckers from the stock, which, in many cases, would soon obtain the mastery, and overpower or outgrow the weaker scion. This is most important in the case of grafted Roses.

Modes of Grafting.—The principle of grafting, as already mentioned, is invariably the same; but there are several modifications, more or less adapted for different subjects, or calculated to insure expedition as well as efficiency. The most expeditious, generally useful, and that most frequently practised in this country, is known as—

Whip-grafting, or Splice-grafting.—The stock and scion may be of equal size, when the most perfect union can be effected; or the former may be of any size or age without materially affecting the success of the operation. When the stock and scion are of equal thickness, the former, after being headed down to the intended point, should have a cut made in a sloping direction (Fig. 19). Entering the knife at the lower end of the intended cut face, bring it out on the opposite side, immediately above a bud if possible. This will help to prevent the thin upper end of the stock dying back. The operator should use a sharp knife only, as the success of the graft is greatly

facilitated by a clean even cut. The scion should now be cut in like manner, reversing the direction of the cut to form an exact counterpart to the other. The directions with respect to leaving a bud at the thin end of the stock apply equally well here. All this should be done as expeditiously as possible, to prevent the delicate tissue of the cambium layer from becoming injured through exposure. Having cut the scion and stock to fit each other accurately, the next step in the operation is to firmly secure them in position, by tying with a piece of matting or raffia. All that now remains is to putty over the splice with some grafting-clay, in order to make it impervious to atmospheric changes

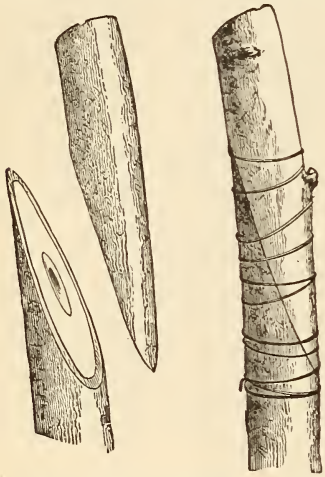


Fig. 19.—Whip or Splice-grafting.

of drought on the one hand, and excessive moisture on the other, either of which would seriously injure or altogether frustrate the union. Take now a piece of the same clay, and placing it round the graft, squeeze it firmly between the hands, making a sort of ball that will not be liable to fall away. This is to prevent the moisture of the graft from drying up, and if the stock is worked close to the ground, it may further be protected by drawing the soil around it. Should very dry weather intervene, in the case of grafting at some distance from the ground, it is sometimes convenient and advisable to wrap some moss round the ball of clay, and even water it at intervals with a fine-rosed watering-pot, to prevent its parting with its moisture too rapidly by evaporation.

Presuming that the stock is of greater thickness than the scion, a condition of frequent occurrence, a slightly different mode of preparation will be necessary. Instead of cutting stock and scion equally thin, the former will have to be headed down with a slightly slanting cut, and then cut off a thin slice of no greater width than the scion will cover, so that the two cambium layers will fit accurately. Union may, however, be effected if one side only of each comes

Fig. 20.—Saddle-grafting.

in contact, but this, being a weaker combination than is desirable, should be avoided. A slight modification of splice-grafting is that called Tongue-grafting. A little tongue is left on the scion to fit into a corresponding notch of the stock. The object of this is to prevent the graft slipping down, thus spoiling the accuracy of contact between the coinciding cambium layers. This requires a little more skill and time, and is not much practised.

Whip or splice-grafting is most extensively employed for all kinds of garden plants, whether in the houses or out of doors, for fruit and ornamental trees, including Conifers.

In **Saddle-grafting** it is most important that the stock and scion should be of equal thickness. The stock, after being headed down, should be cut at the top to form an acutely tapering wedge, with its point upwards. The scion should be slit down the middle some way, and a piece neatly

cut out so as to fit saddle-fashion on to the wedge-like end of the stock (Fig. 20). After tying and protecting with clay in the usual manner, the operation is complete. Knight succeeded in grafting the slender shoots of the Elm and Cherry by this method, when they would have been too slender or too immature to form a union by splice-grafting.

Cleft-grafting is more or less employed in some parts of the country, especially in orchards. Old trees are headed down for the purpose of being re-grafted, and their stems or branches are split vertically with some sharp instrument. The grafts have their ends cut wedge-fashion to fit into these slits, and a number of them may be inserted in the same

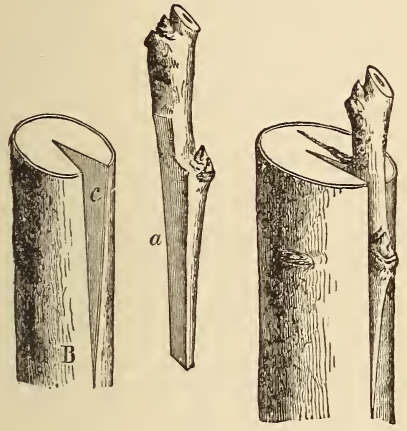


Fig 21.—Improved Cleft-grafting.

branch according to its size, and fitted around the circumference, so that the cambium of the stock and graft may coincide. This mode of grafting, however, is liable to serious objections, inasmuch as the split wood never heals, and is liable to decay. A great improvement on this method is to cut a triangular notch, *c*, along the side of the stem, B, into which a correspondingly prepared scion, *a*, should be fitted, instead of splitting (Fig. 21).

In **Rind-grafting** the bark is slit down vertically and raised by the thin end of a budding-knife or some similar instrument, while the previously prepared and thinly-cut scion is gently slid down beneath the bark, taking due precaution not to injure the tissues of the parts operated upon (Fig. 22). A number of scions may be inserted upon a large branch, which will accelerate the healing of the cut end. Whip-grafting is, however, superior to rind-grafting for this purpose.

Side-grafting is only a convenient term applied to whip-grafting, when employed to furnish a tree with side branches in places where these are naturally deficient. The importance of this may be realised by the gardener when training young trees indifferently or even badly furnished with buds in proper positions. Old trees may also be grafted at the base of their branches, and young wood trained in at some considerable length before the old is cut away. (See BRANCH-GRAFTING OF PEARS.)

Herbaceous Grafting is applied to the grafting of stems while still soft and in a growing condition.

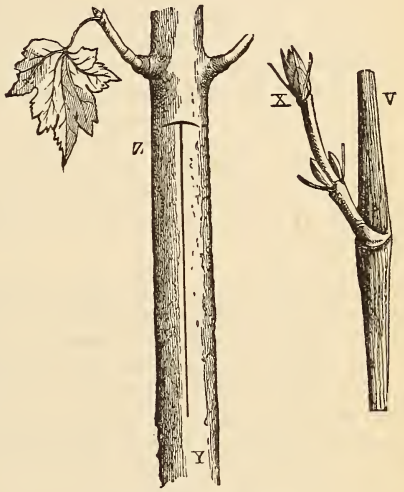


Fig. 22.—Rind-grafting.

It is performed when growing shoots have attained that degree of hardness which will allow them to be operated upon without decorticating, or otherwise bruising the tender tissues. An oblique cut should be made in a downward direction at a point where this degree of hardness has been attained, and if close to the base of a leaf the certainty of success will be considerably enhanced, as the greater degree of vitality at that point will contribute to the earlier healing of the wound; the leaf elaborating constructive material that will hasten the union of stock and scion. The graft, moreover, should be of the same age and thickness as the stock, and should be inserted as quickly as possible after cutting it to fit the incision. The whole must then be bound together with some soft material. After a few days, whatever leaves may be on the stock above the graft should be gradually removed to direct the sap into the scion. Loosen the ligatures in time to prevent damage to the swelling tissues.

Inarching, or **Grafting by Approach** (see Vol. III., p. 13), is more or less employed for different purposes, such as uniting branches, or trees, in rustic work, and for picturesque effect. It is valuable in the case of Vines, and some other troublesome subjects, where other modes of grafting are difficult or impracticable. The principle is the same as in ordinary methods, but instead of severing the scion from its parent stem, both stock and scion are brought in and kept close together, whether in pots or planted out. If the latter, the two should have been planted in the proper season, and when in requisite condition should have a piece cut from each at that place where they can readily be brought into close contact; the cambium layers coinciding as in grafting. Bind them together and protect with clay as in grafting. When appearances suggest that a union is taking place, this may be greatly accelerated by ringing the stem to be cut away just beneath the graft. The whole energy of the returning sap will now be directed into the permanent stock, and when it has been ascertained that a thorough union has been effected, the stem may be severed close beneath the point of union.

Budding.—The practice of budding is employed for much the same purpose as grafting; but the mode of operation is somewhat different in minor matters of detail, and except in the case of inarching or grafting by approach, is performed at a different season, namely, when growth is in active operation. The same impediments, or natural obstructions, that prevent a union between subjects widely removed in the scale of relationship, or affinity, by the process of grafting, are equally potent here, and although some few cases may occasionally present themselves where budding is more successful than grafting, it may be due in a great measure to their histological construction rather than their scale of affinity. A case of this occurs in the Walnut, where grafting in the ordinary way is unprofitable, or impracticable, from the little success attending it. Knight found, or discovered, that besides grafting by approach, the Walnut could be successfully budded by using small buds, generally plentiful at the base of the current year's shoots, and inserting them towards the top of wood formed the season previous.

The methods employed in the art of budding are few, and, as in the case of grafting, one method, or some slight modification of it, obtains a precedence over all the others. This popularity is a result both of the simplicity and the general efficiency of that method. It is known as T-budding, from the incisions that are made in the stock for the reception of the bud being of that shape. When the transverse cut is made at the base of the perpendicular one, the process is styled Inverted T-budding, and its advantages will be discussed presently. The same method is sometimes known by the appellation of Shield-budding, from the shape of the bud employed, and its attached piece of bark. Having selected a branch, with more or less prominent buds, of a tree which it is desirable to propagate, with a sharp knife cut out a piece by commencing half an inch below the bud, passing inwards, upwards, and outwards at the same distance above it. Remove the blade of the leaf belonging to the bud, as that would tend to weaken, or even kill, the latter by evaporating its moisture. The piece of wood cut away with the bud should be carefully removed by laying hold of it between the nail of the thumb and the point of the knife. The condition of the wood determines the season of budding. When the shoots of the current season have attained that firmness which will allow the bark to part readily from the wood, the operation may be successfully performed. Make a transverse and longitudinal slit through the bark of the stock at that point where it is desirable to insert the bud. Holding the latter by its petiole in the left hand, carefully raise the bark of the stock with the thin end of the handle of a budding-knife, and insert the bud immediately. There are several important points to be observed in order to insure the success of the operation. In removing the wood from the bud itself, avoid injuring the inner face of the bark, and see that the root, or core, of the bud is not wrenched out along with the wood, as that would cause failure. At the same time the knife-handle must not be wedged in between the bark and wood of the stock, as that would inevitably injure the delicate tissue of the cambium layer. Press the knife against the inner face of the bark, or even lay hold of the latter between the point of the knife and the thumb, and merely raise it. The upper end of the shield of the bud should be made to fit closely to the undisturbed bark at the top of the T. When the bud has been gently put into position, close the bark of the stock over it, and bind the whole closely over with matting, leaving the point of the bud exposed. The operation is now complete, and its success will be largely dependent upon the quickness with which it is performed, and the preservation of the delicate tissues from the atmosphere. Diagrams will be found under the LIFE-HISTORY OF PLANTS, ROSES, PEACHES, &c.

The operation of Inverted T-budding is carried out in a precisely similar manner, with the exception of the transverse cut being at the base instead of at the apex of the longitudinal one, thus ⊥. The bark in connection with the bud should of course be cut to correspond with this inversion of parts. A diversity

of opinion exists amongst different authorities as to the respective merits attending the two forms of T-budding; but there does not seem to be any decided superiority of one over the other, though the common form is almost universally adopted. After a period of two or three weeks the buds that have been inserted should be examined, and if their attached petioles have fallen away it is a sign that they have taken. The ligatures should now be undone and re-tied more loosely to allow the natural expansion of the growing parts. The necessity of this will be all the greater if vegetation is in an active, vigorous state, in which case the buds will make considerable progress the same season.

American Shield-budding.—This is only a slightly modified form of the preceding, in which the wood is not removed from the bud, but merely pared thin, and inserted in the usual way. It derives its name evidently from the fact of its being extensively employed in America for the purpose of budding stone fruits, such as Plums and Cherries, that mature their wood early, and consequently require to be budded in the dry hot season. This method, however, is not confined to America, but was practised many years ago by Andrew Knight in budding Peach-trees with buds that had been sent some considerable distance, and had become so far desiccated that it was impossible to remove the wood. Besides this, its use is extended to the budding of fruit-trees and Roses, both in spring and also in summer, when the bark adheres too firmly to the wood, or is not inclined to "run," as budders term it.

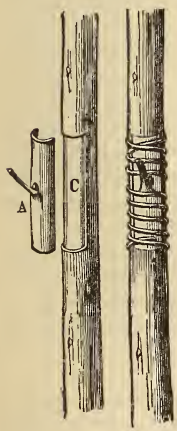


Fig. 23.—Square Shield-budding.

Square Shield-budding is conveniently practised in special cases where the subjects to be operated upon have thick bark. A square piece of bark, C, is removed from the stock, while a similar piece, A, is taken from the tree or branch it is intended to propagate, and made to fit the former exactly, so that the whole of the cambium laid bare will be completely covered. This is more than could have been executed by inserting the shield below the bark of the stock, even if both barks had been comparatively thin. All that is further necessary is to cover the shield with something adhesive to keep out the air or wet, but leave the bud exposed.

Other methods of budding thick-barked trees are known as Flute-budding and Ring-budding. In the former the stock is headed down, and a cylinder of bark removed from the top. Another cylinder of exactly the same dimensions is taken from the tree to be propagated, and slipped on to the wood laid bare on the stock. Bind over the base of the cylinder where it touches the sound bark, and apply some grafting-wax, or clay, to render it air-tight. In the case of Ring-budding make two transverse and parallel incisions through the bark all round the stem or branch to be operated upon, with a longitudinal one. Remove this ring, and take a similar one with buds on it from another tree of the same thickness, or preferably thicker; and in applying it to the stock, after bringing it round tightly, the overlapping end may be cut away. The whole is then bound up, leaving the buds exposed, and the operation is complete.

Grafting-clay and Wax. — Grafting-clay is made in various proportions of two-thirds to one-half clay, and the remainder cow-dung—minus the litter—with a fair admixture of finely-chopped hay. The cow-dung serves to retain the moisture, while the hay binds the whole together and prevents any cracking. All this should be thoroughly mixed and pounded together some time previous to use, then stored in some convenient place and covered, or occasionally supplied with water to preserve it in a moist, workable condition till required.

Grafting-wax, the use of which is necessitated when operating upon small or valuable plants, especially indoors, is variously compounded of pitch, resin, bees-wax, hog's-lard, and occasionally other ingredients. The sole purpose of this grafting-wax, as in the case of grafting-clay, is to protect the cut surfaces of the subjects under operation from the vitiating influences of the atmosphere, whether of dryness or moisture. Therefore, so long as this is effected by non-injurious materials, it matters little about the exact proportions of the mixture. Hog's-lard, bees-wax, and resin are the three most important ingredients of the mixture, and may be compounded in proportions entirely at the discretion of the operator.

The Apple. — Although it can be successfully budded, the usual mode of propagating the Apple is by grafting. The stocks are headed down in January, or about that time, when the buds are quite dormant, provided the frost is not so severe as to crack the freshly-cut wood. The scions should be cut off at the same time, and laid thinly in a trench behind a north wall. It is well to attend to this seemingly trifling matter, as otherwise the

scions may be rendered useless by evaporation. Healthy trees only should be used from which to propagate, and all showing any trace of canker or other disease should be entirely avoided if possible.

Various stocks are used for the Apple, such as the Crabs, English and French Paradise, Doucin, and that raised from the pips of Cider Apples. The Paradise stocks and Doucin are propagated by layering, detached when rooted, grown to a suitable size, and grafted. If dwarf trees are wanted, the stock is headed down to within six or nine inches of the ground, and likewise for pyramids and trained trees. Standards are also grafted low if the sort used is strong-growing, and likely to produce a strong, straight stem; otherwise they are grafted standard-high. Grafting near the ground is advocated, on the principle that trees broken by the wind can renovate themselves by pushing fresh buds from the graft below the breakage.

Whip-grafting in March is the best mode and time. Should the operation be delayed till the season is too far advanced, budding, either common or the American shield, may be practised with a reasonable amount of success. This may also be done in spring, with equally satisfactory results.

The "Report of the Committee of the National Apple Congress, held at Chiswick, October 5th to 25th, 1883," forcibly shows the vital importance of stocks. Soil, situation, and degree of latitude exercise a considerable influence on the growth, productiveness, and quality of Apple produce, but all these can be modified to a remarkable degree by the proper selection of stocks. For orchard trees, the Crab is most universally employed as a stock, and they are the longest-lived, but the produce is seldom of first-rate quality. On light gravelly soil the Crab has the advantage of striking its roots deeply into the subsoil, thus deriving a greater amount of moisture than those trees with restricted roots. On deep, rich, and well-drained soils, in favourable climates, excellent Apples are produced by trees on the Crab. Other stocks are occasionally employed in orchards, such as the Doucin, of a character intermediate in vigour between the Crab and the Paradise stocks. In the good orchard districts of Somersetshire, a variety of Apple known as the Morgan Sweet is more or less extensively used as a stock. The immediate results of grafting on the English Paradise are a dwarfing effect, the earlier and abundant bearing of the trees, larger and more highly coloured fruit, together with superior quality, and general excellence. The largest and best-coloured Apples are those obtained from bush, pyramid, cordon, espalier, and other trees, grafted on the Paradise stock. For wall trees, those marking off the divisions in the kitchen garden, or otherwise grown in restricted spaces, necessitating much pinching or pruning, no better stock could be employed. On the other hand, the Paradise stock, from its shallow-rooting nature, is ill adapted for thin and sandy soils, especially if resting on gravel, being unusually disposed to canker, and become prematurely old and unproductive, the Crab proving the best stock under such conditions. See also the special article upon this fruit.

The Pear.—The most successful and all-round useful method of grafting the Pear is that termed whip-grafting. Several stocks belonging to different species or sub-genera have been successfully employed. The Pear stock, as might readily be supposed from its equality of growth with the scion, is the most natural for the Pear. The orchard is the most suitable place for Pears on the natural stock, on account of the great space required for their proper development before arriving at full bearing condition. A deep, rich, well-drained soil is necessary, before a satisfactory return can be obtained. The roots of the Quince naturally feed near the surface, and are thereby more under the cultivator's control, and more easily warmed by sun and air. The Quince is also a smaller tree than the Pear, and exercises a dwarfing influence over it. The second result is an earlier reproductive condition, and the fruit is not only larger, but better-coloured, and more abundant. This is unquestionably caused by the ill-matched rates of growth between the scion and stock, offering an obstruction to the free descent of elaborated sap towards the root. For bushes, espaliers, and all wall trees, the Quince is therefore the best stock for the Pear. This stock is propagated by layering. Being disposed to start into growth early, both stock and scion should be cut down in December or January. The former should be grafted as close to the roots as possible, that the point of union may be covered with the soil, which will modify the inequality of growth.

The Pear can also be grafted on *Pyrus aucuparia*, *Pyrus Germanica*, *Cratægus oxyacantha*, and probably others; but the results, as far as ascertained, are less satisfactory than those attending the use of the Quince stocks. (See also the PEAR.)

The Peach and Nectarine.—These may be grafted on the same or other species of the same genus, *Prunus*, but budding is most generally practised both in this country and in America, as well as on the Continent. Great difference of opinion exists as to the best stock to use. Knight recommends that the Peach should be grafted on the Peach stock, while admitting that the fruit of those trees budded on the Plum is larger and better-coloured, though inferior in quality. It has been proved, however,

that the roots of the native stock are too tender for our northern climate as well as that of America, where whole orchards budded on this stock are extremely liable to a disease called "the yellows," and comparatively early death. The Almond unites freely with any variety of Peach, and may be employed in warm dry soils. The Plum, belonging to the same genus, is extensively employed as a stock for the Peach and Nectarine in British gardens. Various sorts are advocated, and employed on account of their hardiness, the freedom with which they unite with different varieties, as well as a tendency to earlier and greater productiveness. This result is brought about by the same dwarfing effect, and the obstruction caused by unequal growth, as observed in the Apple on the Paradise, and the Pear on the Quince. It is very obvious in trees budded standard-high, when, after the lapse of some years, the Peach is often observed twice as thick as the stock immediately above the union. Varieties called the Mussel and White Pear Plum are very extensively used as stocks. Trees on the Plum stock are more safely transplanted, and at a greater age, than those on the Peach.

When grafting is practised, it is preferable to use shoots with a little of the two-year-old wood attached; and budding with a piece of wood to the eye may be practised when too early or too late for the ordinary method. In all cases, trees to be worked should be headed down well in advance of growth. One important point in grafting or budding this or any other stone fruit, is to see that wood and not flower-buds are employed.

The Apricot.—The usual method of propagation in this case is budding, more rarely grafting. Several varieties of the Plum stock are used, and, as in other stone fruits, the best, most vigorous and healthy trees are obtained by sowing the stones. So raised, there is less disposition to gum than when the stocks are layered. The most natural stock for the Apricot would be the native one, and when cultivated under glass, at all events, might be employed. The Moorpark variety is stated to succeed badly on any except its native stock, and what seems more remarkable in a long domesticated tree, it can be raised from the stones tolerably true to name. Apricots make their growth early, and budding can be practised from the middle of June for some time onwards. Grafting may be resorted to if budding has failed. Firm, short-jointed wood, with a short piece of two-year-old wood attached, as in the case of the Peach, form the best scions.

The Plum.—The Plum stock is not only the most natural stock for the Plum, but certain varieties afford more or less superior advantages to others. The Mussel, White Pear Plum, and St. Julien are most frequently propagated as stocks; and this is done by sowing the stones. Stocks are also obtained by layering and suckers. The Plum is generally raised from seed to obtain new varieties as well as for stocks, but some sorts, such as the Greengage and Damson, perpetuate themselves pretty constantly and correctly by this method. This is the more remarkable in long-cultivated sorts, and shows a tendency to depart from cross-fertilisation, and become habitually self-fertilising.

The Cherry should be grafted in March, before active growth sets in, but the stocks should have been headed down some two or three months previous, and the shoots intended for scions should have been cut and their lower half laid in moist soil in a cool, shady place. Cherries vary much in habit and rate of growth, and in selecting stocks, due regard must be had to the habit and vigour of those upon which it is intended to work the respective varieties. Standards are most profitably worked on stocks raised from the stones of strong-growing varieties little altered by cultivation. On the contrary, stocks raised from the May Duke and Morello Cherries are suitable for dwarf or weak-growing cultivated sorts, and *Prunus Mahaleb*, from its naturally small size, is particularly adapted for the dwarfest of all. These dwarfing stocks are less liable to gumming than those that necessitate much pinching or pruning.

The Medlar.—This tree, *Pyrus Germanica*, is not very extensively cultivated at the present day, although it might still be improved. It is propagated by the usual methods of budding and grafting on several other trees, such as the Quince, Pear, Whitethorn, as well as upon the wild Medlar. Stocks are raised from stones or pips, as the case may be, and grafted at the usual time, or budded with what is termed the dormant eye, that is, which does not start till the following spring. The Medlar delights in a rich, rather moist loam, but the effects of a dry soil may be somewhat modified by grafting or budding on the White-thorn, and that of a swampy one by using the Quince as a stock, on account of its shallow-rooting character.

The Vine.—Besides propagation by eyes and cuttings, the Vine is also grafted and budded in a variety of ways. This is done by some of the methods already described, although differing somewhat in detail, and radically so as regards the time for performing the operation. If grafted in spring

like other fruit-trees, the Vine would bleed so copiously as to render a union impossible, or kill it. The operation, however, may be successfully performed when the Vine is in full leafage or in flower. This is explained by the foliage being so far advanced that the physiological function of transpiration, executed by them, relieves the pressure caused by the first ascent of the sap in spring, and thereby carries off all superfluous moisture. Whip-grafting is the simplest and best method to employ, and after binding the stock and scion together, cover with grafting-wax; not clay, as the Vine would root into it and frustrate the union. On vigorous stocks, shoots are sometimes produced over twenty feet in a season. Shoots intended for scions should be cut off early in the year, and laid in a moist, shady place, where they will keep perfectly good till midsummer, if required.

The *modus operandi*, also of bottle-grafting, inarching, and bud-grafting, have been sufficiently described in the articles upon Vine culture in Vol. I.

Roses also have been so fully treated of in their proper place that nothing further need be said in this chapter.

The Walnut.—This tree is not so extensively cultivated as it might be in the southern part of this island, where the ripening of the fruit can be depended upon with some degree of certainty. Some difficulty attends the propagation of it by the ordinary methods of grafting, on account of its thick bark, and other peculiarities of constitution. Probably the commonest method formerly considered practicable in England was that of grafting by approach, but Andrew Knight successfully budded it by utilising the small buds usually plentiful at the base of the wood of the current year, and inserting them towards the top of the shoots just one year older. On the Continent flute-budding, and other methods practised in the case of thick-barked trees, as described above, are employed by the French for propagating the Walnut. If size is objectionable, fruiting-trees of small stature can be obtained by working fruit-bearing branches on young stocks, which will come into bearing the third or fourth year after the operation. Knight also succeeded in grafting the Walnut by allowing the tree to make some growth, when the young shoots of both stock and scion were destroyed, to induce the small latent buds to push or swell up, when they were grafted immediately, about the middle of May. Whatever mode of grafting, or budding, is employed on the Continent, the tree is in full growth before it is attempted. Although young trees are easily raised from seeds, the improved varieties can only be perpetuated by grafting, or budding, on the common sort raised from the nut.

The Spanish, or Sweet, Chestnut.—The propagation of this tree presents no serious difficulty, nor requires any special method of treatment, as in the case of the Walnut. The tree can be readily raised from the nuts, and this is the most expeditious, as well as the most satisfactory way to obtain large, healthy, long-lived trees; but for fruit-bearing trees of a small size, they are best obtained by inserting shoots from fruit-bearing branches on young trees, which then produce fruit more or less readily the first or second year from the graft. The best varieties can only be perpetuated true to name by working the respective sorts on seedling stocks.

The Mulberry.—Cultivation of the common, or Black, Mulberry is not carried on to any extent in this country, but wherever attempted it is important, when grown for its fruit, to attend to the best means of securing an early fruiting condition. This can be done by propagating from cuttings of trees in full bearing; but can also be effected by inarching, or budding. The operation must be performed when the foliage is so far advanced as to dispense with the superabundant sap by transpiration. Various methods of budding are pursued on the Continent, and are considered not only more convenient than that of inarching, but equally successful. Flute-budding is practised in the early part of the year, so that considerable growth may be expected the same season. As the scion pushes, so may all shoots that attempt to push on the stock be removed to divert the sap into the graft. Ring-budding, and budding with a dormant eye, is done in the autumn, when mere union is all that can be effected by the remaining energies of the ripening wood. As soon as it has been ascertained that the buds are pushing in the spring following the operation, the stock may be headed down to the graft.

These fruit-trees exhaust the commoner sorts usually grafted in our gardens, but there are a great assemblage of plants belonging to different natural orders throughout the great class of dicotyledonous plants as well as gymnosperms, all more or less important and necessary in garden economy. Rare trees and shrubs of which seeds are difficult to get, or altogether unobtainable, must be increased by other means. So much depends on individual character, or rather of species, and their inherited peculiarities and physical constitution, that experience in the first place is the only reliable guide in such matters. The same plants, under different conditions, will have to be treated differently in order to make success certain, or even probable.

Rhododendrons are readily raised in any quantity from seeds, but the numerous beautiful hybrids and garden forms can only be perpetuated with a reasonable degree of success by grafting or layering. The former is most extensively practised in commercial establishments, because it is by far the most expeditious means of increasing any given variety. Whip-grafting, or side-grafting, and cleft-grafting, are the methods employed, either in spring or in autumn, during the months of August and September. They should then be put under the protection of some glass structure to preserve a uniformly moist atmosphere till union has been effected. Inarching and budding are resorted to under convenient or necessary circumstances. All of these methods are applied to numerous rare and ornamental, as well as variegated plants. Pendulous, and other garden varieties, require to be perpetuated and increased by grafting and budding.

Pendulous varieties of Willow, such as *Salix caprea pendula*, the Kilmarnock Willow, may be trained to a stake, or other support, until they have acquired the requisite height of stem, but it is more expeditious and satisfactory to graft such subjects standard-high on straight and clean stems of the normal upright form. Numerous instances of a precisely similar nature present themselves in the pendulous, or popularly so-called weeping garden forms of *Fagus Sylvatica*, *Sophora Japonica*, *Laburnum vulgare*, *Populus nigra*, *Pyrus aucuparia*, *Fraxinus excelsior*, *Ulmus montana*, and *Ilex aquifolium*, besides woody species of a prostrate, procumbent, or dwarf nature, which it might be desirable to graft standard-high, and introduce for the sake of novelty, curiosity, their ornamental value, or characteristic aspect, in landscape scenery. The variegated and other garden forms of these things, such as the purple and copper-leaved Beeches, the upright variety of the Oak, and others possessing peculiarities of habit, general outline, or otherwise, may thus be perpetuated and increased. This is effected by grafting on the commoner sorts, that can readily be raised from seeds, cuttings, or layers. The numerous varieties of the English Elm, from the slender and twiggy nature of their annual shoots, do not take readily by the ordinary method of whip-grafting, but an eminent authority used to succeed admirably by the process termed saddle-grafting. Stocks are obtained by layering the common or typical sort. The Elm, however, is more successfully budded, as a rule, and others exhibit a similar liking, such as the Ash, Lime, Willow, Thorn, Almond, Peach, Laburnum, Maple. Oak, Birch, Alder, Holly, Beech, and many conifers, are grafted, although some of these, and numerous others, will succeed tolerably well by either method.

A very common practice is to raise ornamental conifers by cuttings, but it is sometimes desirable to propagate scarce varieties by grafting on the seedlings or rooted cuttings of more plentiful sorts. This refers to *Chamæcyparis*, *Thuia*, *Retinospora*, and several highly ornamental species of Abies. Golden varieties of the Yew are sometimes grafted at some height on green sorts out of curiosity, or for the sake of contrast. It is usual to house these things when convenient, and keep them close after the operation till properly united, and then gradually inure to a lower temperature. This may be carried out in autumn, in which case no growth will be made, nor is desirable, till the following spring.

Besides the numerous results and modifications produced by the combined and conjoint actions of stock and scion, we have a few remarkable instances, such as *Cytisus Adami*, now generally considered to be a graft hybrid between *Laburnum vulgare* and *Cytisus purpureus*. This tree frequently produces by reversion both prototypes, on different branches of the same or another plant, together with the hybrid. An analogous instance is recorded of two supposed hybrid Oranges, which, when grafted on a third variety, reverted to either one or other pure parent, or produced a variable and inconstant tree, consisting of all three forms.

HOUSE, AREA, AND WINDOW GARDENING.

By William Thomson.

VERANDAHS.

BY a verandah, we understand a covered walk round the outside of the walls of a house, upon the ground.

If the roof be glazed so much the better; for, since the great majority of climbing plants produce their flowers at or near the extremities of the branches, the presence of a glass roof makes all the difference between plenty of well-shaped flowers and no flowers at all, or else imperfectly developed flowers, pale in colour, and often deformed from having been produced under a dark roof.

As verandahs are usually paved, the plants against the walls of the house must be grown in pots, and these are generally arranged upon shelves or sloping stages between the windows. On the outer side of this covered walk is commonly the lawn, and in this are often made semi-circular beds in the turf in front of the upright supports of the roof, for the accommodation of the plants, or shrubs, which are to be trained up these supports.

One of the great drawbacks to good cultivation

under verandahs is the exposure to draughts of cold winds. Any scheme that can be devised to lessen, or obviate, this difficulty will be gratefully acknowledged by the plants in due course. In some places Venetian blinds are used, but the objection to these is that when closed they obscure so much light, and when open they allow too much wind to pass through. A better plan is to have movable shutters, or hurdles, of lattice-work, made of laths an inch wide placed two and a quarter inches apart; these when hooked up will break the force of the wind without shading the plants too much. By this arrangement of the laths, only one-half of the light is intercepted; if the laths were one and a half inches apart, the plants would lose two-thirds of the light; and if only an inch apart, they would lose three-fourths of the light.

Plants for Supports of Verandahs.—Many of the climbing and trainable trees and shrubs, of which we have previously given short accounts for the decoration of external walls, will be found suitable for the ornamentation of verandahs.

The hardier kinds of climbing Roses, and various sorts of Clematis, are especially to be commended for the outer side of a verandah, since they are easily trained up the pillars or supports, and can be festooned along the eave of the roof between the supports.

AREAS.

There is a twofold method of treating areas—the first having reference mainly to the decoration of the area itself; and the other, that of the porch, balcony, verandah, and walls generally. Taking the last first, it is obvious that creepers, or climbers, planted in the soil of the areas would prove the most useful. This soil is mostly of the worst description, and hence, as a rule, only Ivies and Virginian Creepers, with here and there a Vine, are found in such positions. Blackberries, however, will grow in the poorest soils, the double white and double red varieties being the most showy for bloom, and the common Blackberry (*Rubus fruticosus*) for foliage and fruit. *Rubus laciniatus* combines elegantly divided foliage with large fruits of a very agreeable flavour, whether eaten raw or preserved. The hooked spines of this variety are so sharp and strong as to afford some protection against the attacks of burglars.

For area plants which require good soil special provision must, in most cases, be made. Many plants may be grown in very large pots, in tubs, in casks cut in halves, or in large boxes; but the best of all plans is to build up brickwork about two feet six inches high, at a distance of two feet from the wall, leaving out half a brick here and there along the bottom layer for drainage. This pit should be built as large as possible, because the greater the quantity of soil which it will hold, the better for the plants. If this pit is built against the wall of a kitchen or sitting-room, that side of the pit should be covered with Portland cement to prevent damp getting through. The mode of filling these receptacles for plant-roots, whether pit, or tub, or box, is exactly the same as with an ordinary flower-pot, only that everything has to be done on a larger scale. At the bottom, good drainage of broken bricks or pots, or gravel stones, not too small; above that, sods of turf, or rough peat; and upon that, suitable soil.

Such pits are equally adapted for the growth of climbers above, and of dwarf plants for the area itself. The good soil in them brings forward young plants more rapidly than the soil usually found in areas.

Plants for Covering Walls.—The following are among the best Ivies for this purpose. In planting them, the stronger-growing and the weaker should be so grouped as not to overrun each other.

Hedera Helix.—Among the best varieties for the walls of houses are *Algeriensis*, *Canariensis*, *dentata*, *Royleana*, and *Rægneriana*, although the common large-leaved kind produces a fine effect. Ivies will grow in almost any soil, yet few plants repay one better, or more quickly, for attention in the matter of manure; the richer the soil, the finer and more luxuriant the growth; indeed the soil can scarcely be made too rich.

The annual clipping of Ivy in the spring, though objected to by some, is often practised, and results in a beautiful sheet of pale green leaves, in admirable contrast to the darker ones of winter and of autumn. It is only safe, however, for well-established plants, and a better plan is to nail up a few of the stronger shoots, and prune back all others close to the wall. The Ivy has the great merit of thriving well on north walls, even when exposed to an amount of dust and dirt that would prove fatal to almost any other plant.

Periploca Græca.—This is a capital deciduous twining plant for covering large walls, as it thrives in ordinary soil. Its foliage is handsome and luxuriant, and it bears clusters of hairy flowers of green and brown, but its disagreeable perfume unfits it for use near a dwelling-house.

Vitis vinifera.—Though several varieties of the Grape-vine ripen very fair fruit in the warmer counties of England, yet it is recommended here for its shoots and foliage only. Nailed, or tied, to a warm wall of a house, or other building, few plants

will clothe it with verdure and beauty in less time. There is also a rich variety of form and colour, as well as size of foliage, and the leaves are not only beautiful on the walls, but most useful for the garnishing of desserts. Several kinds have leaves which change to a deep red before they fall off. Others are downy white on the under side of the leaves; and one or more have deeply divided leaves.

Vitis riparia is a hardy North American species with large, heart-shaped leaves, and contrasts well on this account with either of the varieties mentioned of the common Grape-vine. Like them, its flowers are small and inconspicuous, and also, like all other Grape-vines, very fragrant.

Ampelopsis hederacea.—The Virginian creeper is so well known, and generally grown, as hardly to need description. It will grow in any soil, and on any aspect, its beautiful green leaves changing to glowing crimson in September. It belongs to the Vine family, is a true creeper, and climbs to a height of from thirty to fifty feet.

Ampelopsis tricuspidata (also known under the name of *A. Veitchii*) is of a more slender and elegant habit, and grows to about half the height. It is somewhat difficult to start, being more fastidious about soil; but when once thoroughly established it grows rapidly, and develops leaves of large size and greater beauty than the common sort. Both these plants thrive in the smoky atmosphere of towns.

Tecoma radicans.—This fine plant, known also under the name of *Bignonia radicans*, is worthy of a place on any warm wall. In Kent we have seen it doing well even upon an east wall. It is a plant with noble foliage, and very handsome, long, tubular, orange and scarlet flowers, the form of which has caused it to be called by some the Trumpet Flower.

Wistaria Sinensis.—This is more commonly grown for house decoration than any other flowering climber, and it is perhaps the most suitable for the purpose; it flowers freely on south walls in May and June, and more sparingly a second time in August and September. Its blossoms are of a lovely bluish-violet colour, and they hang like bunches of Laburnum blooms, but are very much larger. A very pretty effect can be produced by training this plant and the Scotch Laburnum together. It is commonly said to grow thirty feet, but specimens are to be met with having branches four times that length. There is a white variety which is seldom met with.

Menispermum Canadense.—This hardy, deciduous, North American twining plant may be used for covering trellis-work or walls. It will grow in common soil, and can be raised from seed, from cuttings, or by division of the root. Its flowers are small and inconspicuous.

Piptanthus Nepalensis.—This Laburnum-like plant, which was formerly called *Anagyris Indica*, is not often met with, though it is hardy enough to grow against any warm wall, provided that it is planted in a rich, loamy soil. It is very handsome when in flower, and from the fact of its blossoming in the autumn it is certain to attract attention, from the scarcity of Laburnum-like plants at that season of the year.

Passiflora cærulea.—This Passion Flower is quite hardy on warm walls in the South of England, and is very ornamental both in flower and in fruit; the flowers are pale blue, and the long, egg-shaped fruits are orange; the latter, however, are only produced after warm summers. It likes a light, rich soil, and requires good drainage.

Aristolochia sipho.—The large heart-shaped leaves of this climber are unlike any other foliage, and have a fine appearance when well grown. It requires a warm aspect and a rich soil. Its flowers are of very curious form, being long and tubular, but bent in the middle like some horns.

Clematis.—The hardy species of this genus are so numerous and so varied that, did space permit, our walls might be adorned with their flowers during nine months out of the twelve. Their colours run through red, white, blue, purple, and approach to green. The yellowish-white, *C. Balearica*, blooms in February; the white evergreen, *C. cirrhosa*, in March; the violet, *C. cærulea*, in April; *C. montana*, and the evergreen, *C. Nepalensis*, both white-flowered, in May; the evergreen white, *C. Fortunei*, in June; the white, *C. flammula*, and the large pale blue, *C. lanuginosa*, in July; the purple, *C. viticella*, in August; the yellow, *C. orientalis*, in September; and *C. Jackmani*, with its rich purple flowers, until frosts commence.

Many of these are small-flowered, but what they lack in size they make up for in quantity of bloom. As a mere covering for a wall, the evergreen sorts are, of course, to be preferred. Of the large-flowered kinds there are many beautiful hybrids, which naturally fall into one or other of three groups—spring-flowering, summer-flowering, and autumn-flowering. If one of each of these were selected, and they were trained together, or allowed to ramble over an established evergreen sort, the effect would be exceedingly good, and a succession of blooms would be secured for seven or eight months.

Roses.—The following are among the best for the walls of suburban houses, though the majority fail to thrive in London, or other crowded towns:—

Aimée Vibert.	Gloire de Dijon.
Celine Forestier.	Jaune Desprez.
Cheshunt Hybrid.	Lamarque.
Climbing Devoniensis.	Maréchal Niel.
Climbing Victor Verdier.	William Allen Richardson.

If further variety be required amongst climbing Roses, a selection may be made from the following good sorts:—*Amadis*, brilliant purplish-crimson; *Gracilis*, bright rosy-red; *Dundee Rambler*, white, edged with pink; *Ruga*, pale flesh, very fragrant; *Madame d'Arblay*, flowering in large clusters of cupped, white flowers; *Fortune's Yellow*, orange-yellow; *The Garland*, nankeen and pink, changing to white. The Yellow, White, and Fortune's Banksian Roses are also admirable on warm walls.

Honeysuckles.—The wild Honeysuckle, or Woodbine, *Caprifolium Periclymenum*, is a capital plant for training up the walls of a house. By planting it on south and north walls a long succession of its flowers may be enjoyed. There are several varieties of it—the Dutch Honeysuckle being one of the best. There are also early and late-blooming species and varieties. A Japanese species, with long, slender branches, and pink and yellow flowers of great sweetness, has been common in gardens for sixty or seventy years under the erroneous name of *Lonicera flexuosa;* this has the advantage of being evergreen. So also is the yellow-leaved variety of *Lonicera brachypoda*, commonly called *L. aureo-reticulata*, which is another excellent climber from Japan; it does not, however, produce flowers until it has got thoroughly established, or perhaps we should rather say until it has robbed the soil in which it was planted of most of its nutritive properties, after which it blooms freely, producing yellowish-white, sweet-scented flowers in pairs. The Trumpet Honeysuckle, *L. sempervirens*, differs from most species in its flowers being without scent; but the brilliancy of its scarlet blossoms amply makes up for this deficiency.

Jasmines.—Numerous as are the species of *Jasminum*, there are only a few which can be recommended for walls out of doors. One of these, *J. revolutum*, is a very desirable evergreen, with a profusion of rich yellow flowers in large clusters, the perfume of which is delicious; it prefers a warm aspect. The other two species may be said to girdle the year with their blossoms, since the white flowers of *J. officinale* may be had from May to October, while the yellow blooms of *J. nudicaule* begin in November, and go on all through the winter, if it be mild, up to April. They grow well in any common garden soil. *J. fruticans* is another yellow-flowering kind, which blossoms all through the summer, but does not grow more than five or six feet high, whereas the three preceding sorts are often trained from twelve to twenty feet.

If further variety in climbing plants be wished for, it may be found among the following, most of which, however, require a warm sheltered position:—

Akebia quinata.	Lardizabala biternata.
Berberidopsis corallina.	Smilax aspera.
Bridgesia spicata.	Stauntonia latifolia.
Euonymus radicans.	Trachelospermum jasminoides.
Lapageria rosea.	

These are all evergreens.

Amongst deciduous climbers the following may be mentioned:—

Actinidia polygama.	Physianthus albicans.
Clianthus puniceus.	Solanum crispum.
Humulus lupulus.	Tweedia cœrulea.
Lycium barbarum.	

Some of these, though not strictly climbing plants, lend themselves readily for training against walls.

There are also some strong-growing annuals and herbaceous plants which may be usefully grown in sunny areas; for descriptions of which we must refer our readers to our remarks upon balcony and window plants.

The plants hitherto mentioned for covering walls all partake more or less of the character of climbers. There are, however, many trees and shrubs which have a very ornamental effect if trained against a wall. Several kinds of fruit-trees may be used in this way, particularly Pears, Cherries, and Plums; and if the wall is well exposed to the sun, a good crop of fruit may be expected to follow in due course.

Laburnum vulgare.—The common Laburnum may occasionally be seen trained as a wall-tree, with its branches tied to a balcony.

Laburnum alpinum, or the Scotch Laburnum, is a better kind. It flowers after the common Laburnum. Its blossoms are longer, larger, and more elegant; and they have the additional recommendation of being sweet-scented.

Pyrus aucuparia.—The Mountain Ash, or Rowan-tree, will grow in almost any soil; it is found wild in England, in exposed situations, in limestone districts, and will, therefore, grow in the chalky rubbish that often gets mixed with soil in areas. Its leaves are elegantly pinnate, and its bunches of bright red berries are very showy in the autumn.

Amongst trees allied to those bearing edible fruits, but grown for the sake of their blossoms, there are many very beautiful kinds which are suitable for ornamenting walls, such as the Japanese Quince (*Cydonia Japonica*), the Almond, the Double Cherry, the Double Peach, the Flowering Currant, and the Crimson Crab (*Pyrus Malus floribunda*).

Among evergreens the following are most useful:—*Magnolia grandiflora; Cotoneaster microphylla*, and *Cratægus pyracantha*, both having white flowers followed by red berries; *Ceanothus azureus*, with bluish-lavender flowers; *Escallonia macrantha*, having clusters of little crimson bells; *Illicium religiosum*, with bunches of greenish-yellow flowers, and dark

green leaves; *Andromeda speciosa*, covered with clusters of little white bells.

Many shrubs are worth growing for their foliage only; such, for instance, as—

Ficus carica, the common Fig, which is particularly recommended for areas, where the paving appears to protect the roots from frost in winter, and from drought in summer. With good drainage, and liberal supplies of soap-suds and manure-water, it seldom fails to thrive. If chalk, or lime rubbish, can be mixed with its soil, so much the better. If planted against a wall, eatable fruits may be expected, and noble foliage will certainly recommend it. It is often seen twenty feet high, and succeeds well in London, and other smoky towns. There are many varieties of Fig; the hardiest for out-door cultivation being the Brown Turkey.

Laurus nobilis.—The Sweet Bay-tree is a fine evergreen, and its aromatic leaves are much used for flavouring farinaceous puddings. It is known in England more commonly as a bush than a tree, and in the warmer parts of our island forms handsome clumps, growing up to twenty feet in height. It is, however, impatient of frost, and does best where it is well screened from cutting winds. It, therefore, ought to succeed well in warm areas, as it will grow in any common garden soil.

In sunless areas, Ivies, and such plants as Privets, Aucuba, Phillyrea, Euonymus, &c., can be grown.

Syringing must be frequently and freely attended to, especially if soot, or dust, is liable to settle on the leaves.

Ferns are particularly suited for cultivation in areas, as the majority of them prefer shade. The soil in which they grow best is peat, sand, and loam, mixed in various proportions. Those who collect the wild English species must be careful to note the description of soil in which they find the plants growing; they can then imitate the mixture as nearly as the materials at their disposal will permit.

In planting a Fern great care should be taken that the crown of the plant should be well above the surface of the soil after the process is finished. This applies equally to planting in a pot, and to planting on ground. A low pyramid of the proper soil should be made at the spot where the Fern is to grow, and the point of the pyramid should be a little higher than the general surface of the soil. The Fern to be planted should then be taken with both hands, the tips of the fingers being collected together under the crown; it should thus be placed upon the top of the pyramid; by then drawing away the fingers in opposite directions, the Fern will be left poised on the pyramid with its roots spread out around. An inch of soil pressed gently down over the roots completes the planting.

The following Ferns will do well in shady areas:

Asplenium Adiantum nigrum.
Asplenium fontanum.
Asplenium trichomanes.
Athyrium Filix-fœmina.
Blechnum spicant.
Cyrtomium falcatum.
Cystopteris fragilis.
Lastrea æmula.
Lastrea dilatata.
Lastrea Filix-mas.
Lastrea oreopteris.
Lastrea spinulosa.
Onoclea sensibilis.
Osmunda cinnamomea.
Osmunda regalis.
Polypodium vulgare.
Polystichum aculeatum.
Polystichum angulare.
Polystichum lobatum.
Pteris aquilina.
Struthiopteris Germanica.
Scolopendrium vulgare.

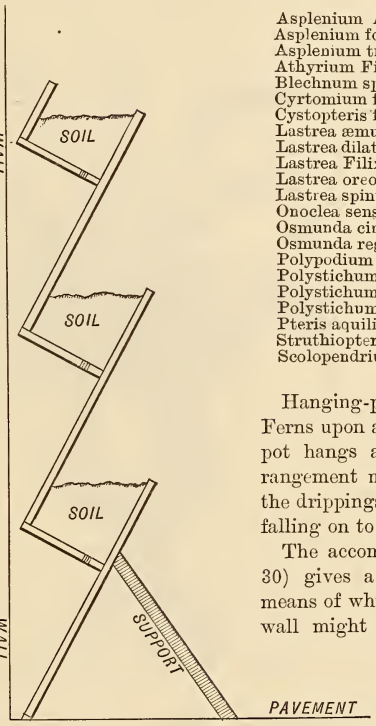


Fig. 30.—Wall Boxes.

Hanging-pots are well adapted for Ferns upon area walls; but where one pot hangs above another, some arrangement must be devised to prevent the drippings from the upper pot from falling on to the plant below.

The accompanying engraving (Fig. 30) gives a section of a frame, by means of which the whole surface of a wall might be covered with plants. It could be made of wood, or partly of wood and partly of slate. If made entirely of wood, it should be fitted together with brass screws, which should be well greased. When complete, it should be taken to pieces, and every piece of wood must have three coats of oil paint; and when thoroughly dry all the parts are to be again screwed together. Planks of Elm-wood, fourteen inches wide, would be found very suitable for this purpose. It will be noticed that provision is made for the drainage to run down behind the pot next below it.

PILLARS, PORCHES, AND PORTICOES.

There are no better, nor more useful, plants for clothing these than the following, or other varieties of the so-called evergreen Roses (*Rosa sempervirens*), viz.—*Félicité Perpetuelle*, with small creamy-white

blossoms; and *Princesse Marie*, with reddish-pink flowers; *Myrianthes*, blush edged with rose; *Reine des Françaises*, vivid rose; *Flora*, bright rose; *Banksiæflora*, white with a yellow centre; and *Donna Maria*, pure white, small, and very double.

The use of pedestal plants in pots is too obvious to need more than mention.

HOUSE-TOPS.

House-top gardening will not require any lengthened treatment at our hands. Horticulture at this elevation will be either under glass or in the open. If the roof be covered with glass, instead of with tiles or slates, the top of the building becomes a green-house; and green-house gardening is treated of separately.

If glazed cases are placed upon the roof, our remarks on conservatory windows may be referred to as applicable to gardening of this description.

And if it be intended to grow plants in the open air upon the house-top, we have little to add to what we have said on the point under the heading of balcony gardening. Where it is possible to provide a sufficient body of earth for Vines, or Figs, to grow in upon the house-top, there seems no reason why good crops of fruit should not be obtained in localities where the atmosphere is not too much affected by smoke. The plants would have to be tied down to a light framework of wood, which must be kept about twelve inches away from the tiles, and access must be had to all parts of the plants for the purposes of pruning, training, and gathering the fruit.

Fig. 31.—Plant in Pedestal Pot for Portico.

There can be no doubt that the great majority of houses in England are so constructed that horticulture upon their roofs is an impossibility. This may arise either from there being no access to the roof, or no space even if there were access. But supposing that space and convenient access do exist, care must be taken not to put more weight on the roof than it will bear, for roofs are not often built to carry much more weight than the needful supply of tiles, or slates, to cover them. It would be best, therefore, to take the opinion of a builder, or architect, as to the number of pots that it would be safe to put upon any roof which might be utilised in this manner.

If plants are merely standing on a flat lead roof, little harm is likely to accrue; but upon no account should sloping stages, pressing against an outer wall or parapet, be used without professional advice, as such a proceeding might bring about a serious accident. With buildings only one storey high, much plant-growth may be attempted, either by strengthening the roof to enable it to bear the additional weight, or building an independent stage over it, so that none of the extra weight shall fall on the roof. Many sheds and outbuildings in yards and gardens might be so constructed that some portion, if not the whole, of the roof might be used for horticultural purposes.

It is much to be regretted that more attention has not been given by architects to roofing houses with glass, and so constructing this part of a house that it may be used for the growth of plants in pots. A comparatively small additional outlay at the time of building a house, in raising the external wall two or three feet, strengthening the joists over the ceilings of the top rooms, and boarding them over, providing a trap-door and a step-ladder, and arranging for proper ventilation in the glass-covered roof, would convert the house-top into an excellent green-house instead of its being, as now, a useless part of the building. Some horticulturists are bewailing, and reasonably so to some extent, the number of miles of railway banks and slopes that are allowed to remain uncultivated, when in many districts good crops of fruit and vegetables might be grown upon them. If they would think of the thousands of acres of useless house-tops now in England, and would advocate the building of all new houses with glass roofs, we should have more cheerful homes from the greater abundance of flowers, and better health from the production and consumption of fruit, which we do not now eat because we have to buy it.

THE PALM FAMILY.

By William Hugh Gower.

THE noble order *Palmaceæ* is at once the most majestic, interesting, and useful of all plants in the latitudes where they prevail. In more temperate climes the family of the Grasses are more useful, and support greater numbers. But in the region of Palms, extending from 40° north to 35° south latitude, no plants can rival them in beauty and usefulness; indeed, to describe all their products and uses would fill many volumes. These so-called princes of the vegetable kingdom have long been extensively cultivated on the Continent of Europe, though but little cultivated in British gardens till quite a recent period. Even now there are far fewer Palms in our public and private gardens than in those of France, Belgium, Germany, and Holland. The finest collection in Europe is to be found in the Royal Gardens at Herrenhausen in Hanover, under the directorship of Herr Wendland, who has made these plants the study of his life. These are accommodated in a noble house upwards of a hundred feet in height.

Palms produce two distinct kinds of growth, one kind having fan-shaped leaves, more or less divided at the edges, and the others long, pinnate leaves, with the appearance of beautiful feathery plumes. Most of them are easily cultivated, though some are of such slow growth, that any one planting seeds when young of such kinds as the great fan-leaved Talipat Palm (*Corypha umbraculifera*), or the Palmyra Palm (*Borassus flabelliformis*), would have but little prospect of seeing them become trees with six-feet stems, though they lived to be eighty years old. These slow-growing species are not suitable for the purposes of every-day decoration, but we have plenty of elegant rapid-growing Palms which assume their proper character, and become ornamental, in two or three years.

Palm-stems are all simple (with the exception of the Doom or Ginger-bread Palm of Egypt, *Hyphœne*, and this is remarkable for its dichotomously branched character); these stems vary considerably in stature and appearance; some Palms have stems from fifty to a hundred and fifty feet high, and several feet in thickness; whilst others have slender reed-like stems, which climb up and through the forest-trees, festooning them with a living garland, and frequently reaching a length of two, three, and four hundred feet; others, again, have slender stems seldom exceeding the height of a few feet.

Palms enjoy heat and moisture; in fact the Arabs say, "The Palm-tree has its roots in the water, and its head in the oven." For soil use peat and loam in equal parts, while the plants are young, because they grow more quickly; but as they get older, and the idea is to prevent overgrowing the accommodation, use nearly all loam. The pots must be drained well, as all the species enjoy copious supplies of water, both to the roots and overhead; these plants should never be allowed to suffer from drought, and it may be taken as a safe guide by the amateur, that the more spiny a Palm, the more water it requires; indeed, some require to be grown in water.

Palms, like other plants, from a variety of causes may get into a sickly state; whenever this occurs shake the old soil from the roots, carefully wash the latter, re-pot the plant into a clean pot with fresh soil; the pot should then be placed in a pan of water, and kept standing in it, in the warmest position in the house. Avoid over-potting Palms, it is an English mistake, and prevents these plants being of so much use for decorative purposes as when kept in smaller sizes. In Continental gardens, tubs and pots of a comparatively small size accommodate very large specimens, which, instead of repotting, are top-dressed with cow-manure, and receive extra supplies of water, and thrive admirably under this treatment.

Acanthophœnix.—A few handsome plants comprise this genus. The name is derived from *acanthos*, "a spine"; thus Spiny Phœnix, the latter being the Greek name of the Date Palm. They have at various times been placed with the *Arecas* and *Calamus*, but they do not agree with either.

These plants have stout stems, somewhat swollen at the base, which, with the petioles, are armed with long and sharp spines; the leaves are pinnate, spadix simple, the female flower having one male flower on each side; fruits small, one-seeded. They possess no economic properties.

A. crinita — highly ornamental, but too tender for general decorative purposes. Leaves long and beautifully arched, pinnate; petioles broad and sheathing at the base, where they are densely armed with long and slender black spines; pinnæ long and narrow, tapering to a point. Mascarene Islands.

A. ruber—large, and a somewhat lax grower compared with the preceding. The young leaves are deep red, but change with age to a deep green; petioles furnished with long black spines. Mascarene Islands.

Acrocomia.—A small family of tall-growing plants, deriving their name from the elegant head of feathery leaves on the summit of the stems—thus *akros*, "top"; and *krome*, "a tuft." They belong to the *Cocoineæ*, or Cocoa-nut section of the Palm family; nuts small, and not edible, very hard, take a fine polish, and are used in the manufacture of toys, &c.; they also yield a delicately-scented oil, which is used in the preparation of choice toilet-soaps.

A. rostratum—a slender-stemmed species, attaining a height of about thirty feet; the stem, and the sheathing base of the petioles, are armed with black spines some two inches or more in length; leaves four to eight feet long; leaflets upwards of a foot long, the terminal one broad, and divided at the top, rich green on the upper side, white beneath. Brazil.

A. sclerocarpa—a gigantic Palm, forming a stout, erect stem, which is usually swollen in the centre; it attains a height of forty feet or more. In a young state this is a very handsome plant forming a large head of feathery plume-like leaves. Para, where its native name is "Mucaja."

A. vulgare—this is a noble plant, and widely distributed; called "Tucum" in Brazil, and "Chambiara" in Peru; it attains a height of sixty feet, with a very stout stem, bearing a large head of its feathery leaves, which are deep green above, silvery-white below. Amazon.

Areca.—A large family of spineless plants, known as the "Cabbage Palms," as the heart and young leaves are frequently scooped out, and cooked as a vegetable. When old, these trees are called "Areec" by the natives, hence their generic name. The spadix is branched, enclosed in a double spathe; the male and female organs are in separate flowers (unmixed), but both forms of flowers are borne upon the same spike; fruit small, one-seeded.

Arecas are highly decorative plants, several being admirably adapted for out-door decoration during the summer months.

A. alba—when small this is a slender plant, sufficiently delicate for dinner table decoration, and as it increases in size, its beauties also increase. Mascarene Islands.

A. Alicæ—a small-growing plant, with pinnatifid leaves, which are very deeply divided, but leave a broad wing to the midrib; it is a very ornamental species. North-east Australia.

A. aurea—this plant is similar in habit to A. alba. Seychelle Islands.

A. Catechu—a tall, slender Palm, attaining a height of twenty to thirty feet; its elegant pale green leaves, and very long leaflets, render it very ornamental in the stove, but it is too tender for general decorative purposes. The fruits of this species are the famous Betel-nut, so largely chewed by the whole of the Indian and Malay races. Cochin China and Malay Islands.

A. Madagascariensis — a dwarf plant with spreading pinnate pale green leaves; very distinct and ornamental in the stove. Madagascar.

A. monostachya—an elegant small-growing plant, with a slender stem which seldom exceeds a few feet in height, and bears a spreading head of pinnatisect leaves of a deep green. It is useful for any purposes of decoration where small plants are required. Australia.

A. oleracea—this is the common "Cabbage Palm" of the West Indies; it is an elegant plant in a young state, with bright green pinnate leaves; very useful for decorative purposes. It attains to a height of forty or more feet. The young leaves and heart of this species are frequently scooped out and cooked as a vegetable, which has much the flavour of the Cabbage of our kitchen garden. West Indies.

A. rubra—a bold-growing plant, with spreading pinnate leaves, the leaflets being very long and deep green; in the young state the whole leaves are of a beautiful bright red, hence the name. It attains a height of twenty or thirty feet when mature, and is one of the very best of its class for general decorative purposes. Mascarene Islands.

Astrocaryum.—This genus belongs to the Cocoa-nut section; the plants comprising it are all handsome in a young state, and many of them are majestic when mature, their straight cylindrical stems towering up some thirty, forty, and even sixty feet, bearing large feathery heads of pinnate leaves. All are natives of South America, and are not generally useful for decoration, but are very distinct and ornamental in the stove.

A. acaule—a very handsome dwarf species, destitute of a stem, but producing large leaves, some nine or ten feet high; these are pinnate, narrow, and clustered; the whole plant is armed with long and formidable flat, black spines. Marshy woods on the Rio Negro.

A. Japari—the stems of this species are usually clustered, slender, attaining a height of about thirty feet, and profusely armed with spines. It is handsome as a young plant.

A. Munbaca—this is a dwarf kind, and therefore well adapted for small houses; the stem is slender, and armed with spines, and is about eight feet high, seldom exceeding twelve feet. Rio Negro, and near Para.

A. Murumuru—a very handsome species, attaining a height of about fifteen feet; the stems and base of the sheathing petioles being armed with large black spines, some six inches long and bent downwards. Andes.

Attalea.—This genus derives its name from *attalus*, "magnificent," in reference to their grand appearance. When mature they reach a height of some fifty to sixty feet or more, with tall, straight, cylindrical stems, and an immense plume-like crown of leaves; but, although these plants reach such a great height, they put on their ornamental appearance in quite a young state, long before the formation of any stem, and in this state are admirably adapted for the decoration of halls and corridors, independent of their beautiful appearance in the stove.

A. Cohune—this is a fine ornamental plant, producing large nuts, which yield a very useful and valuable oil. Its leaves are pinnate and plume-like, the pinnæ a foot to eighteen inches long, and deep green. Honduras.

A. compta—this is a beautiful pinnate plant of somewhat smaller growth than A. funifera. The nuts of this species are used for dessert, and the leaves are used in the manufacture of hats. Brazil.

A. funifera—the article so largely used in the manufacture of brooms and brushes, and also for rope-making, and known by the name of Piassaba, is the produce of this Palm; it is the fibrous matter from the base of the leaf-stalks. The fruits known as Coquilla-nuts are also the produce of this species, and are much used by the turner in the manufacture of knobs for umbrellas, handles for doors, and many other uses. The leaves are pinnate, beautifully arched, and bright green. Brazil.

Bactris.—A genus of slender-growing Palms, all of which are handsome in a young state, but lose their beauty as they get old; their stems are reed-like, and seldom exceed six or seven feet in height, although there are a few species with stouter stems, which grow some forty feet or more. All the species are densely armed with black or brown spines, which usually encircle the stems in bands at various intervals. The flower-spikes are enclosed in a double sheath, which presents a rather formidable appearance with its dense armour of black

spines. Male and female flowers, separate, but borne upon the same spike. Of these plants Spruce says: "In the forests of the Amazon the *Bactrides* are almost as numerous as the *Geonomas*, and along with them form no inconsiderable portion of the undergrowth." From some of the species of *Bactris* walking-sticks, with closely-ringed stems, are obtained, and are sold under the name of "Tobago canes." All the species are worthy of the amateur's attention as young plants. In *Bactris concinna* we have a species growing from ten to fourteen feet high, with narrow segments, admirably adapted for table decoration. Common on the Amazon and Solimoes.

B. flavispina—is distinguishable by the long spines being yellow, with black tips, height about six feet. Brazil.
B. integrifolia—has reed-like stems, and a handsome crown of entire dark green leaves, bifid at the apex; the petioles densely armed with flat, black spines. It grows in the inundated forests on the Rio Negro.
B. Maraja—is the giant of the family, attaining a height of from forty to fifty feet, the stem being densely armed with large spines; it is very similar to the other species when young, but has a stouter stem. Brazil.
B. simplicifrons—is a dwarf plant with simple bi-lobed leaves; is usually found growing with Geonoma baculifera near Para.
B. tenuis—this is an elegant small-growing species, with a reed-like stem, some ten feet high, and a beautiful small head of leaves; stem and base of petioles armed with flat, black spines. Rio Negro.

Brahea.—A small genus of fan-leaved Palms of rather slow growth, but very handsome as a genus; they are principally distinguished by their hermaphrodite flowers, and some other minor details. The species all belong to the Western Hemisphere.

B. dulcis—stems stout, but very slow-growing; the petioles are somewhat downy, armed at the edges with numerous small spines, and surrounded at the base with a persistent net-work of tough brown fibres; blade of leaf nearly circular, much plaited, divided into shallow segments at margin, brilliant green on both sides. S. America.
B. filamentosa—this plant is of somewhat recent introduction; it was originally called Pritchardia filamentosa, but has now been placed in this genus. A rapid-growing Palm; petioles long, profusely armed on the edges with yellowish-brown spines; leaves fan-shaped, deep green; the edges of the segments are ornamented with very long white filaments, which hang down, covering the plant in a thread-like veil. Lower California.

Calamus.—A large family of very slender-growing pinnate-leaved plants, deriving their name from *kalom*, "a reed"; some few species form elegant erect trees, but the majority become scandent, and climb the forest-trees by the aid of the hooked spines with which the petioles are armed; these are the canes so familiar to us by the name of "Rattans," and which are used in this country for making and mending the bottoms of chairs. Canes to the value of nearly £40,000 are annually imported into this country; the Malacca canes used for walking-sticks are the produce of *C. Scipionum*, whilst the bridges which are thrown over the rivers and valleys in Northern India, are usually supported by ropes made of the stems of *C. montanus*; the best "dragon's blood" of commerce, used for varnishes, for wood-staining, and various other purposes, is the produce of *C. Draco*.

Calamus produce their flowers on long branching spikes; their fruits are one-seeded, and are covered with smooth scales, which are dry and hard, and polished as if they had been varnished. Some species have been removed from this genus and named *Dæmonorops*, the principal difference being that the spathe enclosing the flower-spike is sufficiently large to quite enclose it; there are, however, so many intermediate forms, that for the sake of simplicity we here include all under the name of Calamus.

In a young state these plants are amongst the best and most useful for table and room decoration, and also form graceful objects in the stove, either as standards or climbing up pillars. Before they become unsightly they may be thrown out to make room for others. Most of the species throw out suckers freely, and therefore with ordinary care a good supply of young plants can be maintained.

C. accidens—a very slender and elegant plant, with long, arching, pinnate leaves, and narrow, closely-set leaflets, armed with long and slender black spines. Indian Islands.
C. adspersus — the stem of this species is reed-like; leaves pinnate; petioles furnished with slender black spines along the whole length; leaflets about six inches long. Indian Islands.
C. asperrimus — A bold-growing plant, with broad pinnate leaves about twelve feet in length, and beautifully arched; leaflets one to two feet in length, an inch broad, clothed with hair-like bristles; petioles densely armed with long, stout, black spines. Its canes are useless. Northern India.
C. ciliaris—in a small state this is one of the most handsome of its class. Stems slender; pinnate leaflets very closely set, clothed with light hairs, the whole leaf having a very feathery appearance. Indian Islands.
C. Draco—a very handsome species, forming an elegant table-plant while young, but growing to a majestic plant. Leaves upwards of six feet high; the petioles well armed with long, flat, black spines; the leaflets pendent, upwards of a foot long. Indian Archipelago.
C. flagellum — this is a slender plant, and very common in Sikkim, where it is known by the name of "Reem," and is found growing from the level of the plains up to 3,500 feet elevation, climbing to the tops of the highest trees. Its canes are soft and quite useless; leaves upwards of six feet in length; the leaflets pendent, about a foot long, and an inch broad; petioles armed with stout spines, which are white, swollen at the base, the points black.
C. Jenkinsianus—leaves about six feet high, and arching; leaflets about a foot long, and an inch broad, deep green; petioles armed with long, flat spines. Its canes are useful, but are mostly applied to home uses, and not much exported. Common in dense forest of the Terai, Sikkim.
C. leptospadix—stem slender; leaves closely set; petioles densely clothed with spines. The plant is known by the name of "Lat." Its slender stems are long, soft, and of no commercial value. Sikkim.
C. Lewisianus—a bold-growing plant with the additional charm of a white leaf-stalk, excepting the sheathing base, which is

nearly black. Indian Archipelago.

C. macrauthus—a magnificent species, growing some two hundred feet long; stems thick and strong; it is known by the name of "Greem" by the natives. Leaves from ten to fifteen feet long; leaflets one to two feet in length, and deep green. Sikkim.

C. melanochætes—is a very beautiful slender plant; the spines on the petioles are much swollen at the base, and pale green with brown points; leaflets long and pendent. Indian Archipelago.

C. montanus—this is the most valuable of the "Rattans" in Northern India, where it is known by the name of "Rue," and is becoming scarce on account of the great demand for its stems. It is found in the dense forests of Sikkim at 4,000 to 6,000 feet elevation.

C. palembanicus—very handsome as a young plant, with large pinnate leaves. Indian Archipelago.

C. plumosus—a very handsome species; the pinnate leaves are very plume-like (hence its name); white spines, with black points. Indian Archipelago.

C. Rotang—as a young plant this species is very beautiful, and is admirably adapted for table decoration. The stems climb, and attain several hundred feet in length; leaflets nearly a foot long, and less than an inch broad. Indian Archipelago.

C. Royleanus—this is a beautiful species for decorative purposes; the whole leaf and petiole are dark green, clothed with spines. North-western Himalayas.

C. schizopathus—This species is called "Rong" by the natives of Sikkim; it seldom exceeds ten feet in height. Leaves about twelve feet high, and the pendent leaflets are from one to two feet long. Sikkim.

C. viminalis—A small-growing handsome species, with a very slender stem, bearing pinnate leaves; leaflets narrow, some six or eight inches in length; petioles armed with very long flat white spines. Indian Archipelago.

Caryota.—This genus is easily distinguished from all other Palms by its twice-divided leaves (bipinnate); the leaflets also have a broad end which appears to have been roughly bitten off (præmorse), with a wedge-shaped or cuneate base. Some of these plants attain a height of some fifty or sixty feet, but even the tallest grow slowly, whilst some of the smaller-growing kinds are extremely beautiful. Caryotas produce a terminal flower-spike; the flowers are borne on long catkin-like spikes, some ten feet or more long, these spikes being in great bunches. After the terminal spike appears, a large bunch of flowers is produced from the axils of each leaf in succession, until the lowermost is reached, by which time the plant is dead. The male and female organs are produced in separate flowers, although both sexes of flowers are borne upon the same spike; the fruits are of a purplish colour, and usually one or two-seeded.

Caryotas are most useful, their hardy constitution enabling them to withstand a very low temperature.

C. Cumingii—this is one of the most beautiful and most dwarf species in the family; its stem seldom exceeds ten feet in height, the leaves from five to six feet long, and three feet wide, twice divided; leaflets coriaceous, wedge-shaped at the base, præmorse at the apex, and deep green on both surfaces. Philippine Isles.

C. furfuracea—a larger-growing plant than the preceding, attaining a height of about forty feet, leaves about nine feet long; the petioles are clothed with a mealy tomentum, of a rusty-brown. Java and Sumatra.

C. propinqua—a very handsome species, about three feet high, leaves bipinnate, six to ten feet long; the wedge-shaped præmorse leaflets are finely toothed on the margins, and deep green on both surfaces. Java.

C. Rumphiana—a very distinct species, with a stout, smooth stem; the leaflets are very broad, and more flat than those of the other kinds, in which they are more or less oblique. Indian Archipelago.

C. sobolifera—stem about twelve feet in height; leaflets pale green. It produces young plants from the base rather freely. Malacca.

C. urens is found growing at Rungbee, near Darjeeling, at a height of 4,400 feet above the sea, where the temperature in January is often as low as 40°. It is the largest species in the genus, attaining a height of from fifty to sixty feet. Called "Simong Roong" by the natives in Sikkim, who extract a somewhat coarse sago starch from the trunk. From the flower-spike a large quantity of Palm wine or toddy is obtained, which, when boiled down, yields "jaggery," and also sugar candy. The fibre from the leaves, called "kitool," is largely used for making ropes, baskets, brushes, brooms, and various other articles. Leaves, when mature, about twelve feet long, leaflets six to nine inches long; deep green on both sides. Generally distributed throughout India and the Indian Islands.

Ceroxylon.—A small family closely allied to *Iriartea*, deriving their name from *keros*, "wax," in allusion to the produce from their stems, which has led to their being called "Wax-Palms." The species are tall and handsome, suitable for any decorative purpose. Unlike the majority of Palms, which are found luxuriating in the heat of the tropics, this plant forms dense forests in the high mountains which separate the river Magdalena from the Cauca in New Grenada, and it extends nearly up to the snow-line.

C. andicola.—A majestic species, the stem of which attains a height of nearly a hundred feet, but it must take many years to reach this size; it is cylindrical, and measures about a foot in diameter at the base. Leaves pinnate, erect, and arching, borne on the summit of the stems like a splendid crown of gigantic plumes, some twelve feet long; it usually bears from thirty to fifty pairs of leaflets. In the young state its leaves are very long and simple. Resinous and inflammable wax is obtained by scraping the stems, and is used as an ingredient in candle-making, but very little comes to this country. New Grenada.

Chamædorea.—These are elegant plants, with slender stems, which seldom exceed fifteen or twenty feet in height; many of them much smaller; all are admirably adapted for decoration at one year old. For such purposes they have no equals, and they are very largely used throughout Germany and Russia. The genus is distinguished by its slender, closely-ringed stems; the leaves are pinnate, with a broad bifid terminal leaflet; the male and female organs are borne on long branching spikes, each on separate plants, and the fruit contains a single hard seed. The stems are largely imported for walking-canes, and may be readily known by the close

rings of scars upon them. Chamædoreas are all natives of America.

The name comes from *chamai*, "dwarf," and *dorea*, "a gift," but we are unaware how it applies.

C. Arenbergii—an extremely handsome species. The slender stem bears on its summit a beautiful crown of pinnate leaves. Guatemala.

C. brevifrons—the leaves of this species seldom exceed a foot or eighteen inches in length; pinnate, with sessile leaflets, broad at the base, and tapering to a point. New Grenada.

C. elegans—stem erect, bearing drooping pinnate leaves, from two to three feet in length, leaflets nine to twelve inches long, narrow, tapering to a point, and bright green. Mexico.

C. Ernesti-Augusti — stem five to six feet high, and about two inches in diameter, closely ringed, bearing on the summit a head of six to twelve broadly bifid leaves, which are one to two feet long, including the stem-clasping petiole, and one foot broad, serrate at the edges, and dark green, the female plant usually bearing rather more leaves than the male. The flowers are of a deep orange-colour, about the size of a pea, and are extremely ornamental, but very fugacious. The female spadix is usually simple, but sometimes double, and with the peduncle about two feet in length, thick, and fleshy; flowers orange-red, same size as the male; spadix deep green, changing to a bright coral-red. Tabasco, New Grenada.

C. Geonomiformis — a species similar in appearance to the preceding, but smaller in all its parts, some four feet high, and branching, pendulous panicles; green. Guatemala.

C. glaucifolia—this is a slender-stemmed species, with long plume-like pinnate leaves, which render it very elegant; glaucous-green. Guatemala.

C. graminifolia—stem reed-like, carrying a beautiful feathery head of leaves from three to four feet in length. The flowers are orange-colour, borne in branching panicles; the spadices are pendulous, and about twelve inches long. It is one of the most elegant members of the family. Costa Rica.

C. macrospadix—this species forms a stout stem, and bears a large head of long and broad pinnate leaves, which are about four feet in length. Costa Rica.

C. microphylla—this miniature Palm-tree forms a stem and a crown of leaves, and flowers and seeds, when only a few inches high. Stem reed-like, deep green, curiously freckled with white; leaves pinnate, nearly a foot long. The flowers are produced on branching spikes, which are shorter than the leaves. Brazil.

C. Sartorii — a free bold-growing species, with a slender stem, and long pinnate leaves, some four feet in length, and beautifully arched, leaflets sessile, about nine inches long, and one and a half inch broad. Mexico.

C. scandens—a slender species, which, after reaching about six feet in height, begins to climb; leaves pinnate, about three feet long, and glaucous. Mexico.

C. Tepejilote—this is a handsome species, with a stout stem, eight or ten feet high, having numerous closely-set rings of scars; leaves pinnate, three to four feet in length, bearing about eighteen to twenty pairs of leaflets, which are twelve to eighteen inches long, and one to two inches broad; the male flowers golden-yellow, spadices pendulous, nine inches or more long, borne in a branching panicle. The name of this species is peculiar, and comes from the Mexicans, who gather the young unexpanded flower-spikes of the Chamædoreas, and this one in particular, and use them as a vegetable, which they call "Tepejilote." Eastern Mexico.

C. Warscewiczii—stem slender, about six feet high. Guatemala.

C. Wendlandii — a bold-growing, handsome plant, with a slender stem, bearing a crown of pinnate leaves, two to three feet in length; leaflets sessile at the base, about twelve inches long, and two broad. Though all the species here enumerated are admirably adapted for general decorative purposes, this species is by far the best for the dwelling-house. Mexico.

Chamærops.—This genus has been described in the green-house division of these plants; the species introduced here are often called Green-house Palms, and treated as such, but they thrive best in the stove.

C. Martiana—this is a superb but rare species, with an erect and slender stem, attaining a height of some twenty or thirty feet. The petioles are slender, armed at the edges with small teeth-like spines, and tomentose, one to two feet long, their bases enveloped in a rough net-work of dark brown fibres; leaves fan-shaped, nearly circular, and flat. Himalayas.

C. stauracantha—this and the following species are by some separated from this family by the name Acanthorrhiza, the principal difference being in the segments of their leaves being split to the base; stem rather robust—crowned with palmate leaves. It forms a quantity of aërial roots at the base of the stem, which become spiny with age. Mexico.

C. Warscewiczii — stem stout, petioles unarmed, two to three feet in length, enclosed at the base in a dense mass of white fibrous network; blade of the leaf from eighteen inches to two feet in diameter, nearly round, and more or less split down to the base; upper side a very deep green, silvery-white beneath. Central America.

Cocos.—A family consisting of numerous species, varying widely in size; to this genus belongs the well-known Cocoa-nut Tree, *Cocos nucifera*, to which we, however, merely refer, and omit further notice of here, as it is not useful for decorative purposes. But there are several small species which are invaluable, and which we shall briefly describe. The name of the genus is said to be derived from *coco*, a word signifying "a monkey," from the resemblance of the nut to the head and face of that animal.

C. butyracea—leaves three to six feet long, simple and pliated when young; becoming pinnate, the leaflets aggregate by threes and fours; highly ornamental. New Grenada.

C. elegantissima—an elegant small-growing plant, with long, arching, plume-like leaves. The species resembles C. Weddeliana, but its leaflets are rather broader, and its colour is bright instead of deep heavy green. Brazil.

C. Orinocensis—this species is rare and very beautiful, and has been thus described: "This handsome Palm, notable for its short curling, yellowish foliage, forms large beds on the bare granite of the mountains of the Orinoco, between the mouths of the Vichada and Meta. It is a conspicuous ornament on the hills around Maypures, where it is called Corozito. Stems slender, twelve to sixty feet high."

C. plumosus — this very beautiful plant derives its name both from its long feather-like leaves, and also from the long drooping branches of the spadix, which are very plume-like; as a young plant it is very useful for general decorative purposes, whilst as it attains maturity it is magnificent. Brazil.

C. Weddeliana — amongst graceful Palms, this species stands pre-eminent, and very few plants have ever been such universal favourites. Stem slender, bearing a grand crown of arching feathery leaves, from one to four or five feet long, finely pinnate; the leaflets very narrow, deep green above, clothed with a grey tomentum on the under side. Banks of the Amazon and Rio Negro.

Corypha.—This genus is peculiar to Asia. The name comes from *koryphe*, "the summit," in reference to the large terminal branching spadix of flowers which they bear when they are mature, so that

the "Talipat Palm" never flowers until near its end. These plants are very slow in growing, and therefore not amateurs' Palms, but on account of their gigantic size, and their associations, they deserve a passing notice.

C. Gebanga—called "Gebang" by the natives—is a plant with a tall, stout stem; the large fan-shaped leaves are of a glaucous-green, the segments split about half-way down. The leaves of this plant are invaluable to the Javanese for making hats, baskets, thatching their huts, and they procure a rough quality of sago from its stem. Java.

C. Taliera—stem twenty to thirty feet high, bearing large fan-shaped, dark green leaves. It is a common plant in India, and its leaves are used for similar purposes to the "Gebang."

C. umbraculifera—this is the famous "Talipat Palm" of the Cingalese; it has a stout cylindrical stem, some seventy or eighty feet high. The leaves are made into fans and carried before people of rank; they are also used for books, and the manufacture of many other useful articles.

Desmoncus.—A small family, which in their scandent habit resemble the Calamus of the Eastern Hemisphere; the petioles are prolonged into long slender tails, armed with numerous recurved spines; the flowers are produced in simple branched spikes; the male and female organs in separate flowers; the male flowers are all on the top, and the females on the lower portion of the branches; the fruit is small, hard, one-seeded, and almost round. Very ornamental when young. They lose their lower leaves and much of their beauty when they begin to climb, and can then be thrown away. The name comes from *desmos*, "a bond"; *ogkos*, "a hook," in allusion to the peculiar spiny tail-like extension of the leaf-stalk.

D. macranthus—the native name of this Palm is "Jacitara;" its stems climb, or trail, along to the length of about fifty or sixty feet, and they seldom exceed the thickness of a man's thumb; leaves pinnate, one to two feet long; leaflets broad and bright green. Rio Negro.

D. Mexicanus—stems slender, similar in appearance to the preceding; leaflets very deep green; the petioles armed with long black spines. Chiapas.

D. polyacanthos—stem slender and very spiny; leaflets oblong, tapering at both ends, bright green; whole plant armed with long spines. Brazil.

Elais.—This genus includes the Oil-Palm of Western Africa, the produce of which forms the principal ingredient in the making of Price's patent candles; it is also familiar to most home travellers, in the shape of the yellow fat used for the lubrication of the axles of railway carriage wheels; it is largely used, too, for soap-making. The natives who obtain this oil by collecting the fruits and boiling them in water, until the oil rises to the surface, use it in large quantities, eating it as butter. They also use it for oiling their bodies, partly to keep away insects, and partly as a substitute for clothing, of which they are entirely destitute.

A very pleasant wine is also obtained from this plant, and the fibres of the leaf-stalk are used for brooms, basket-making, &c.; and after the seeds are crushed, and all the oil extracted, the refuse is made into oil-cake, now so largely used for cattle-feeding. Another species, *E. melanococca*, is found in tropical America; it, however, is not so handsome a plant, neither has it yet been found of so much commercial value.

E. Guineensis (the Oil-Palm).—This, in a young state, is a very handsome plant, and its constitution is very robust, so that it may be used for all decorative purposes; it attains a height of from twenty to thirty feet, bearing a large head of feathery pinnate, dark green leaves, which are ten to fifteen feet in length. Abundant and general in Western Africa.

Euterpe.—A genus containing but few species, but all are handsome and useful for decorative purposes, even in a young state. As a genus, they are distinguished by their branched flower-spikes, which stand at right angles to the stem, just below the sheathing bases of the leaves; the male and female flowers are distinct, but on the same plant; on the lower part of the branches the males and females are in pairs, the topmost parts bearing mostly male flowers only. There would appear to be several very elegant plants of this family yet to be introduced to our stoves, for Spruce says: "Two very pretty *Euterpes* (a large one known as *Chouta*, and a smaller one as *Chontilla*) grow at the head of the valleys in the Peruvian Andes, at from 3—6,000 feet; and at about the same elevation there is a *Chontilla* so slender that walking-canes are made of it, and its habit is almost that of *Geonoma*, but the leaves, the edible Cabbage, and the fruit are all *Euterpe*."

E. montana is a more dwarf plant than E. oleracea, its stem seldom exceeding about twenty feet in height, and this is very much swollen at the base. The crown of young leaves is cut out (like E. oleracea) and eaten as Cabbage. West Indies.

E. oleracea (the Cabbage Palm)—when young this plant produces elegant pinnate leaves, with bright green pendent leaflets; very hardy and very useful as a decorative plant; when mature, however, it forms a slender erect stem, from ten to 120 feet high, its large plume-like leaves forming a graceful head; the young heart leaves are cut out and eaten, and having much the flavour of our Cabbage, this has given rise to its popular name. From the fruits a drink is made of a very sweet flavour, and it is said to be a favourite beverage with the dwellers on the Amazon. This drink is called "assai," from which it is often called the Assai-Palm, and it is frequently found in our plant-houses under the name of E. edulis. Widely distributed on the Amazon and Rio Negro.

Geonoma.—This genus is nearly allied to *Chamædorea*, and contains a great number of species. Spruce enumerates nearly half a hundred species as found by him on the Amazon and its tributaries. They love shade, being always found in dense forests, where they form a large portion of the

underwood; nearly all the species have slender stems, but a few are entirely destitute of them; and all are extremely beautiful, though few are useful for general decorative purposes. Their slender ringed stems are imported in great numbers for walking-canes. The name is derived from *geonomos*, which signifies "skill in agriculture," probably from the supposed difficulty of propagating these plants. But as they seed and throw up suckers freely, there is little difficulty either in raising or cultivating them.

G. binervia—stem slender, bearing pinnatisect leaves some two or three feet in length; leaflet pendent, acuminate at the apex, about nine inches long, and deep green; base of petioles enveloped in a rough network of brown fibres. Central America.

G. Carderi—stem slender; leaves pinnate; the leaflets plaited, the terminal lobe broad and bifid, deep green. Columbia.

G. congesta—a variable but handsome plant. Stem slender; petioles sheathing; blade of leaf narrow at the base, widening upwards, sometimes unequally lobed, at others entire, saving the bifid apex; the leaves are eighteen inches or two feet in length, and six inches wide, plaited, and bright light green. Costa Rica.

G. elegans — stems very slender, bearing pinnate leaves about a foot long; leaflets sessile, the terminal one broad and bifid —the remaining portion consists of about two or three pairs; whole leaf brilliant pink when young, bright shining green when mature. Brazil.

G. gracilis—stem slender, as also are the petioles; leaves beautifully arched, two or three feet long; leaflets narrow, pendent, very long, and deep green. Much resembles, and is a dangerous rival to, Cocos Weddeliana for table decoration; the leaflets, however, are longer and pendent in Geonoma—shorter and flat in Cocos. Costa Rica.

G. macrostachys — a very dwarf plant with a slender stem; leaves upwards of a foot long, usually divided into about three pairs of leaflets, which are broad, ending in long tail-like points: these, when young, are rich deep red; when mature, deep green. River Amazon.

G. Martiana — this grand plant is to be found in some collections under the name of G. Seemannii, but although it was first introduced in a living state by the late Dr. Seemann, it was already a named and described species. It is an exquisitely beautiful plant, with a dwarf but rather stout stem; the petioles are short, which bring the leaves very close together; leaves entire, some two feet long (on good specimens), about two inches across at the base, widening upwards until at the deeply bifid apex it is upwards of nine inches in width. The leaf is very strongly plaited: in a young state, bright crimson; but when mature, a very dark green. Central America.

G. Porteana—stem slender; leaves one to two feet long, pinnate; the leaflets are sessile, pendent, upwards of six inches in length and two broad, the terminal one deeply bifid, rich deep green. River Amazon.

G. procumbens—stem stout, attaining a height of about fifteen feet; leaves pinnate, three to four feet long, and beautifully arched; leaflets pendent, about twelve inches long, and nearly two broad, deep green. The beautiful plume-like appearance of the crown of leaves renders this extremely handsome. Costa Rica.

G. pumila—as its name implies, this is a dwarf species with entire leaves, which are deeply lobed at the apex; sometimes however the leaves become irregularly pinnate; colour, bright green. New Grenada.

G. Schottiana—this is a very elegant table plant; its petioles are slender, supporting arched pinnate leaves some three feet in length when mature. It has much the appearance of G. gracilis, but differs in having shorter and more erect leaflets. Brazil.

G. undata—a robust plant, with a very stout stem; petioles clasping the stem, and enveloped in a rough network of brown fibres; leaves irregularly divided, three to four feet long, with broad, much-plaited leaflets, the terminal one deeply cleft; colour, intense deep green. Tovar.

Guilielma.—The genus contains about three species, all similar in appearance, and all useful, even in a young state, for decorative purposes. The Peach-Palm has nowhere been found in a wild state, but is cultivated largely for its fruits over nearly the whole of South America. Its native name in Venezuela is "Pijiguao," in Peru it is called "Pisho-guayo," and in Brazil "Popunha." "The wood is black and tough, and takes a fine polish, and is the usual material for lance-shafts among the Jibaro and Zaparo Indians."

G. speciosa (the Peach-Palm of Humboldt).—Stems slender, erect when mature, sixty to ninety feet high, and densely armed with long and sharp black spines; leaves pinnate, pendent, and about seven feet long; the petioles very spiny; leaflets clustered together in threes and fours, and standing in all directions, giving the whole leaf the form of a beautiful, curled, bright green feather. The fruits are about the size of a Peach, but oval in shape; when ripe, rich bright red and yellow. Spruce says: "The thick firm flesh is mealy when cooked; something between a Potato and Chestnut in flavour, but superior to either." It is found nearly all over the South American continent, and is cultivated largely on the river Amazon.

Hyophorbe.—A very distinct group of Palms, all of which are extremely useful for decorative purposes in a young state. The flowers are produced on simple branched spikes, which spring from the stem just below the leaves; the male and female organs are usually in separate flowers, and produced on separate plants. The stems of all the species become much swollen as the plants become aged, which renders them very distinct.

H. amaricaulis—stem very stout, much swollen below; leaves pinnate, and spreading, four to six feet or more long; leaflets numerous, broad, tapering to a point; the petioles are stout, dull maroon, with a glaucous tinge, and a stripe of orange up the back of the midrib. It is sometimes called Areca speciosa. Mascarene Islands.

H. Commersonii—this beautiful and useful Palm is usually found under the name of Areca lutescens, and Hyophorbe Indica; its stem is slender, often clustered, and from twenty to forty feet high; with age it forms a swollen base; the petioles are a dull orange-yellow, freckled with grey; leaves long and arching, pinnate; the leaflets long, somewhat pendent, and bright shining green. It is one of the finest Palms in cultivation for all decorative purposes. Isle of Bourbon.

H. Verschaffeltii — similar in general contour to the preceding, but the stem has somewhat of a triangular outline; the leaves are pinnate; petioles dull brown, striped at the back with bright orange; leaflets very long and broad, with a white midrib. It is also called Areca in some collections. Mascarene Islands.

THE HARDY FRUIT GARDEN.

By D. T. Fish, assisted by William Carmichael.

THE PLUM.

AFTER the Apple and Pear, the Plum is probably our most valuable British fruit, alike in its sanitary and feeding properties, and its commercial importance. The Plum is a native tree, though the species *Prunus domestica* is seldom found wild in this country, and not a few of the so-called wildings are obviously the waifs and strays of old gardens. Several species of Plums are, however, found wild in great plenty, and are reproduced from seeds. These are the *P. spinosa*, or common Sloe; the *P. institia*, the Engrafted or Bullace Plum. The Damson, Winesour, and Mussel Plums are also found wild in many parts of Britain.

The hardiness and beauty of the Plum render it useful as an ornament in woods and shrubberies, while the spotless whiteness of Plum orchards forms a charming and novel feature in landscapes overdone with verdure. The average height of Plum-trees, seldom exceeding fifteen or twenty feet, fits them for purposes and uses as ornamental trees, that few others could fill so well. At one time even the timber of the Plum-tree, small as it was, was valued for musical instruments and other purposes, but the wide choice of foreign woods has robbed that of the Plum of any commercial importance it possessed. Its fruit, however, is still most highly prized, alike for culinary purposes and dessert. As much as fifty or even a hundred pounds an acre have been realised from Plums. The demand and consumption are so enormous, that in addition to consuming our own Plums, we are the best customers of the French and other foreign nations, and have begun to import canned Plums from the Antipodes.

Plums may be had in good condition from the middle of July to the end of the year. By growing such early varieties as the July Greengage, Mirabelle, and such late October Plums as the Ickworth Impératrice, Reine Claude de Bavy, and Late Rivers, with such splendid intermediate varieties as the Greengage, Royale Hative, Jefferson, Kirke's, and Coe's Golden Drop, four months are freely furnished. But this by no means exhausts the Plum season, for such valuable sorts as Coe's Golden Drop, the Impératrice, and a few others, can be kept in first-rate condition two or even three months after being gathered. The simplest means of thus preserving them fresh and sweet, is to hang them up by the stalks in a cool dry room. Only Plums that have persistent stems, and the tendency to shrivel slightly after gathering, can be thus simply and successfully preserved till wanted. The two Plums already named gain rather than lose condition in the process of keeping.

The Propagation of the Plum.—This is by seeds, suckers, layers, grafting, and budding (see Propagation of the Apple, Pear, Peach, and Apricot). There is little to be added special to the Plum, except the oft-repeated truism that only the stones of the finest varieties should be sown when improved sorts are aimed at. Also, that some sorts of Plums, notably the Damsons and the Gages, reproduce themselves from seeds more or less truly. These also form good stocks for the best varieties of Plums, especially when cordon, or small trees, are desired. By carefully selecting the seeds of the weaker-growing Gages it may be possible to insure a more dwarfing and fertilising stock for the Plum than has been hitherto obtained from the seeds of the Mussel, which, with the St. Julien and White Pear-Plum, are mostly sown for the raising of Plum and Peach stocks. These are doubtless well fitted for the growth of full-sized Plum-trees in orchards and large gardens, but are too gross-growing for Plum-trees in pots, and the modern restricted modes of culture and training. To facilitate the dwarfing of the plants, and the increase of their fertility, the Mirabelle Plum, or so-called *Prunus myrobolum*, has also been largely used as a Plum stock, and seems to answer well. For time and mode of sowing the stones, and preparation of the young plants for working, see Peaches.

Grafting and Budding.—Grafting is more common among Plums than other stone fruit. Early grafting is the key to success, and even then so important is bud-dormancy to success, that the scions should be taken off and laid in the ground in a cool place in December, and the stocks headed down to within a few inches of the point of grafting by the end of January. The grafts may then be inserted by the middle of February, and if the process is completed with skill, eighty per cent. of the scions will take, and be free from gumming at the point of union. Summer, or rather July or August grafting, may also be successfully practised. Budding is on the whole the best mode of propagating Plums. July is the most suitable month, and the buds may be inserted from six to eighteen inches off the ground for dwarfs, and any height desired for standards.

Planting.—See Apples, Pears, Peaches, for modes and time of planting. On dry bottoms rather heavy soils are best for Plums. Unctuous loams, rather than more friable ones, yield the most permanently satisfactory results. But almost any fairly good

mixed soils will grow good Plums. The Plum is a surface-rooting tree, and two feet of good border is sufficient for it. But on dry bases—as on the chalk—it had better have six inches or a foot more.

The Plum being a much smaller tree than the Apple or Pear, standards may be planted in orchards from fifteen to twenty-five feet between the rows, and about fifteen from tree to tree in the rows. Plum orchards furnished with pyramidal, or bush-trees, may be planted in rows from seven to ten feet apart, and from five to seven feet from plant to plant. Plum-trees on walls should have from twenty to thirty feet between them, as many sorts—such as Coe's Golden Drop, the Jefferson, and even some of the stronger-growing Gages—being thus skeletonised on warm walls, make vigorous shoots, that fruit most profusely when allowed to run far, and furnish wide areas. Espaliers being much cooler, the trees need not have more than half these distances between them. Ground or wall cordons have done remarkably well: the first, at distances of four feet apart, and carried along a foot from the ground; the second, at distances ranging from a foot to eighteen inches.

The best Plums—such as the finer Gages, Coe's Golden Drop, Jefferson, Kirke's, and many others—deserve the best wall and warmest aspect that can be found for them, on dwelling-houses, stables, out-houses, farm-buildings, as well as in the garden. Some of the hardier Plums will also ripen on north walls, and most even of the best will thrive and fruit on all other aspects.

Plums may also be planted in lines, or groups, in the garden, and orchards formed of them alone, or mixed with other fruit-trees. The Plum is also admirably adapted for placing in hedgerows at distances of from thirty to fifty feet. It would be easy to work and plant specially straight and tall-stemmed trees for this purpose; and, if properly managed, Plum-trees in hedgerows could hardly fail to combine beauty and profit. Groups of tall trees in shrubberies, and woods, would thrive well in many a sheltered nook and corner, provided always that Bullfinches, that get not only ravenous but mad over Plum-buds, are kept from them.

Pruning and Training.—See Peach, Apricot, and Pear. One word must, however, be added about Plum cordons, especially those grown near to the ground. No attempt must be made to keep the bunches of fruit-spurs too close to the stem. By permitting them to grow somewhat freely and roughly, so that the cordon is at least a foot through, heavy crops of Plums of first-rate quality may be gathered from these yearly, unless they are blighted by frost, or picked clean of blossom-buds by the *bullies*.

General Culture.—For protection of the blossoms or fruit, mulching, or surface-feeding, and watering of the roots, thinning, swelling, and serving the fruit, see Peaches and Nectarines.

Fruit-thinning is, however, of more importance for Plums than for either of these fruits, as the Plum is apt to set enormous crops in favourable springs, which so exhausts the trees that they seldom bear again for several years.

Suckers are also often produced in such profusion from Plum-roots as to become a really troublesome disease. Surface digging, or even root-pruning, is very apt to increase the number of suckers.

As to swelling and ripening Plums, nothing helps them so much as a heavy overhead syringing on the evenings of all hot days, from June until they approach maturity.

The gathering of Plums differs considerably from that of Peaches, Nectarines, and Apricots. Even the right time to gather choice dessert varieties is more difficult to determine, as the visible signs of maturity are far less strongly marked. Orlean, Gage, and other Plums begin to fall when ripe, and these may be carefully gathered or shaken into nets or mats. But all dessert Plums should be gathered and served with the stalks intact, and what may be called the cling-stalk varieties are best severed from the trees with a sharp knife or scissors.

Plums need very careful handling so as not to displace the bloom, and should be garnished with their own leaves in dishes or baskets.

Diseases and Insects.—The Plum under healthy conditions is less subject to disease than any other stone fruit. Even gum, unless it runs to great length, seldom does serious harm. Canker seldom appears unless it is caused by gum, or what are called blights, and mildew is far less common on Plums than on Peaches. The fact of the near relation of Plum stocks to their heads has been held to favour their greater immunity from these and other diseases.

The gum of the Plum often seems to originate from the attacks of an insect or moth, *Tortrix Wæberiana*. The moths deposit their eggs in the crevices of the bark, and two generations of caterpillars are mostly produced, one in June and the other in August. These penetrate and feed on the inner bark, and result in the production of red-looking spots, most appropriately called "rust" by cultivators.

The sawfly, *Tenthredo morio*, and the red grub of the Plum, *Tortrix nigricana*, also prey on the fruit. The first lays its eggs in the calyx of the bloom, and the larvæ, so soon as hatched, eat their way into the fruit, which grow more rapidly for a time in consequence of their interference, and then drop off.

The second affects the fruit at a later stage, all the infected ones ripening and dropping prematurely. The remedy for both is the same: collect all the small dropped Plums, and also all that ripen prematurely on the trees, and burn them. For red spider, thrip, weevils, scales, ants, earwigs, woodlice, wasps, blue-bottles, rats, mice, squirrels, see Peaches, &c.

Aphides.—These are, as a rule, far more troublesome on Plums than on other stone fruits. They also attack them in force many times throughout the growing season—immediately after blooming, again in May, and not unfrequently as late as June and July. As these pages were being written, in July, 1885, swarms of aphides that came in huge flights attacked a row of pyramidal Plums to such an extent as to render them white with an excretion resembling honeydew. On shaking the trees the insects flew up like swarms of bees.

The best remedy for these late flights of aphides is the immediate removal and burning of the breast-wood, and the cleaning of the leaves and boughs left, with frequent overhead delugings of clean or tobacco water or sewage.

Classification of Plums.—Dr. Hogg, in his latest edition of his Fruit Manual (1884), describes a hundred and eighty varieties, exclusive of synonyms. The family being so numerous and so varied, various attempts have been made to group Plums into sub-families or classes. The most successful of these attempts at classification rests on certain well-known and easily recognisable distinctions. Such, for example, as the smoothness or downiness of the summer shoots, the distinction between free-stones, in which the flesh separates readily from the stones, and cling-stones, those in which it is difficult to part the flesh from the stone. Other distinctions are based on the form, size, character, origin, and uses of the fruit. Thus we have Nectarines, Gages, Orleans, Apricots, Prunes, Imperials, Perdrigons, and Mirabelles, and in each of these classes there are free-stone and cling-stone Plums. Again, the Nectarine, Gage, Prunes, and Imperials have smooth summer shoots, while the Orleans and Apricots have downy shoots. We give a few samples of Plums in each of these classes of free-stones and cling-stones:—

Nectarine Plums.

Round Fruit.

Free-stones.	*Cling-stones.*
Angelina Burdett.	Belgian Purple.
Kirke's.	Late Rivers.
Nectarine.	Sultan.

Gages.

Bryanston Gage.	Knight's Green Drying.
July Greengage.	McLaughlan.
Reine Claude de Bavy.	

Orleans.

Free-stones.	*Cling-stones.*
Coe's Late Red.	Morocco, the only cling-stone in this largish family.
Early Orleans.	
Royal Hative.	

Apricot Plums.

Apricot.	Huling's Superb.
Drap d'Or.	Reine Blanche.
Rivers's Early Apricot.	White Bullace.

Prunes.

Oval Fruit.

Autumn Compôte.	Impératrice.
Early Rivers.	Pond's Seedling.
Red Magnum Bonum.	Prince Englebert.

Imperials.

Coe's Golden Drop.	Jefferson.
Oullin's Golden.	White Magnum Bonum.
White Impératrice.	

Perdrigon.

Diamond.	Goliath.
Red Perdrigon.	Prune Damson.
Reine Victoria.	Winesour.

Mirabelles.

Early Mirabelle.	Denniston's Superb.
Washington.	White Damson.

Plums are also generally divided into kitchen and dessert varieties. The former include such well-known sorts as Victoria, Diamond, Pond's Seedling, Early Rivers, Orleans, Belle de Septembre, Coe's Late Red, White Magnum Bonum, Damsons, Winesours, and Bullaces; and the latter, all the Gages, and such well-known sorts as Coe's Golden Drop, Jefferson, Kirke's, Impératrice, Huling's Superb, Woolston Black, &c. But these distinctions are not strictly preserved in practice, and, with less sugar, all the Gages, and the majority of other dessert Plums, are simply admirable for culinary purposes and conserves.

Select Varieties of the Plum.—Out of the hundred and eighty or more varieties of this fine luscious fruit, it is somewhat difficult to make a limited selection that shall include all the best, and omit none that should be generally grown. In the following list, it will simplify matters to leave out all the classifications already referred to, excepting the two most important—those of free-stones and cling-stones, and those used for dessert and culinary purposes. The first will be distinguished by the letter F, the second by C, the third by T, for table, and the last by K for kitchen.

The following is Mr. Carmichael's selection of twenty-two varieties:—

Select List of Plums.

Autumn Compôte (K.F.)—fruit very large, oval, bright red, and handsome; of first-rate quality for preserving. September.	Brahy's Greengage (F.T.)—fruit very large, similar to the old Greengage in flavour, and earlier; an excellent variety. August.
	Bryanston Greengage (F.T.)

—fruit large; an excellent variety of Greengage. End of September.

Coe's Golden Drop (C.T.)—fruit large, oval, pale yellow, rich and delicious. This is one of the finest late Plums for dessert, or preserving, and will keep for some time after it is gathered if rolled up in tissue paper. September.

Czar (F.K.)—fruit large, oval, red. Plum valuable for cooking and dessert. Early in August.

Damson, Prune (C.K.)—this is the finest flavoured of all the Damsons. Middle of September.

Denniston's Superb (C. T.)—fruit large, nearly round, greenish-yellow, and good flavour. The tree is a great bearer. August.

Duke of Edinburgh (F.K.)—fruit large; an excellent fine-flavoured culinary variety. The tree is a great bearer. Early in August.

Frogmore Damson (F.K.)—This variety was raised by Mr. Ingram of Frogmore. It is a most prolific bearer, and excellent for preserving. Early in September.

Grand Duke (C.K.)—fruit large; an excellent late culinary Plum, and bears freely. Ripe, end of September.

Greengage (F.T.)—a well-known variety; one of the richest of all Plums. End of August.

Jefferson (C.T.)—fruit large, oval, golden-yellow, mottled with red, juicy and sugary, rich, and deliciously flavoured; one of the best dessert sorts. August.

July Greengage (F.T.)—a valuable early form of Gage. End of July.

Kirke's (F.T.)—medium-size, round, purple, good flavour, and great bearer. Middle of September.

Large Black Imperial (C.T.K.)—fruit large; an excellent culinary variety. The tree is hardy and prolific. September.

Lawson's Golden (C.T.)—fruit medium size, juicy, sweet, and richly flavoured; a fine dessert Plum. September.

Nouvelle de Dorelle (C.T.)—fruit large, oval, dark purple, juicy, sweet, and rich; a first-rate variety. Ripe in October.

Pond's Seedling (C.K.)—fruit large, and handsome; a valuable culinary Plum. The tree is a great bearer. September.

Prince Englebert (C.K.)—fruit large, oval. The tree is a great bearer; a valuable culinary Plum. September.

Smith's Early Orleans (F.K.)—fruit medium size. The tree is hardy, and a prolific bearer; a good culinary sort. August.

Transparent Gage (C.)—fruit large, round, yellow, rich, and exquisitely flavoured. Ripe, end of August.

Victoria Denyer (C.K.)—fruit large, bright red; a first-rate culinary variety. The tree is very prolific. September.

The following are also first-rate varieties of Plum:—

Angelina Burdett (F.T.)—roundish, dark violet; flesh golden, rich and juicy.

Belgian Purple (C.K.)—deep purple, with a thick bloom, greenish and sweet flesh.

Coe's Late Red (C.K.)—large, rich red, having yellowish, sweet flesh.

De Montfort (F.T.)—a rich Plum, resembling Royal Hative.

Diamond (C.K.)—dark, juicy, and excellent.

Dunmore (F.T.)—rich yellow when ripe, medium-sized, rich, tender, and sweet; excellent for dessert.

Early Mirabelle (F.T.)—Yellow, spotted with red, very excellent.

Goliath (C.K.)—one of the largest and best of the so-called Nectarine Plums.

Guthrie's Late Green (C.T.)—large oval Plum, ripening towards the end of September.

Huling's Superb (C.T.)—one of the richest of all the yellowish-fleshed Plums.

Impératrice, Golden—deep yellow-red, streaked with the same.

Impératrice, Ickworth—small size and oval, of the deepest blue-purple, and highest excellency.

Knight's Green Drying (C.T.)—one of the finest and largest Gages, requiring a wall to ripen it properly.

Late Greengage (T.)—equal to the Green, and ripening in October.

Lawrence's Gage (F.T.)—large, round Gage, ripening in September.

Mitchelson's (F.K.)—very prolific, black, with yellow, tender flesh.

Oullin's Golden (F.T.)—rich yellow, striped with green, and though not a Gage, it has many of their good qualities.

Peach, or Reine Claude Berger (F.T.)—Plum colour, spotted with amber, large, rich, and melting.

Reine Claude de Bavy (F.T.)—rich, large, and handsome. October.

Reine Victoria (F.T.)—quite distinct from Victoria (Denyer's); this is a fine dessert Plum, something like Kirke's, but later.

Rivers, Late (C.T.)—rich, sugary, sweet, ripening as late as October.

Royal (F. T.)—light purple spotted with fawn.

Transparent Gage (F.T.)—a large and handsome oval Gage, of the highest quality.

Washington (F.T.)—large, deep yellow speckled with crimson dots.

Woolston Black (F.T.)—rich, juicy, melting, fine bloom.

Those who enjoy acidity in their tarts and preserves will add the New Large Bullace, the Cluster White, and common Damson, to the Prune and the Frogmore already named in Mr. Carmichael's list.

The following, and other Plums, ripen in the months stated:—

July—Early Mirabelle, July Greengage.

August—Greengage, Bryanston's Gage, Huling's Superb, Denniston's Superb, Peach, Oullin's Golden, Violet Hative, Perdrigon, Yellow Impératrice.

September—Angelina Burdett, Lawson's Golden, Late Greengage, Coe's Golden Drop, Kirke's, Jefferson, Transparent Gage, Woolston Black.

October — Reine Claude Bavy, Blue Impératrice, Late Rivers, &c.

Plums for Walls.—All the Gages, all the Impératrices, Coe's Golden Drop, Coe's Late Red, Jefferson, Washington, Nectarine, and White and Red Magnum Bonum.

Plums for Orchards.—Among the most profitable Plums for Orchards in favourable localities are the Green and other varieties of Gages, the Early Rivers, Orleans, Damsons, Prince of Wales, Mitchelson's, Pond's Seedling, Prince Englebert, and Victoria.

Not a few housekeepers make a distinction between Plums for cooking and those for preserving. All those specified as kitchen will cook well, but the following are preferred for preserving, or converting into jam:—Autumn Compôte, Damson, Diamond, Greengage, Washington, White Magnum Bonum, Winesour.

It would be difficult to pick out a finer dozen of dessert Plums than the following:—Greengage, Jefferson, Coe's Golden Drop, Kirke's, Transparent Gage, Reine Claude Bavy, Oullin's Golden, Woolston Black, Peach, Perdrigon, Violet Hative, Huling's Superb.

THE CHERRY.

The Cherry-tree in olden as in modern times was valued for its beauty in the early spring, being one of the earliest, as well as, for its size, the most valuable of timber trees. The bark was also largely used for making a rich yellow dye, the gum possesses most of the properties of gum arabic, and the leaves are greedily devoured by most ruminant animals. Useful oils are extracted from the stones, and various wines, spirits, and liqueurs made from the

fruit. The latter is also dried as a preserve, bottled in spirits, as brandy, whisky, &c., and converted into very popular jam and pies. But its most popular and general use is to be eaten raw for dessert. Feasts of Cherries used also to be common, and still prevail where Cherry orchards abound. The practice is to pay a shilling for entrance, and consume the ripe fruit till satisfied.

Classification of Cherries.—The fact of Cherries varying so much in size, colour, form, quality, and that the trees vary so widely in habit and size, has doubtless strengthened the belief in their dual or multiple origin from several species.

The modern classification of Cherries into Bigarreaus, Geans, Dukes, and Morellos, exactly corresponds with what we know of their history, and their distinctive qualities. The fruit of the Bigarreaus are mostly heart-shaped, hence the common name of White and Black Hearts applied to them. The flesh is firm, sweet, rich, mostly white or black; flowers and leaves large; growth of trees strong, generally horizontal. The Geans, or Kentish Cherries, form round-headed trees; the branches, being weaker, are semi-pendulous; fruit red or black, flesh sweet. The May Dukes grow more into pyramidal form; the fruit sweet, juicy, round in form, and red or black in colour. The Morello forms a much lower tree; its weak branches render it semi-pendulous; the fruit is deep red, almost black when ripe, sharp and acid.

The French also throw their Cherries into four classes, far less distinctive than our own. As, however, a large trade is done in early French Cherries, it may be useful to give their classification here. Their Merisiers and Guigniers are one class, and include the wild Cherries of the woods; red, black, or white, and somewhat bitter. The Guigniers are improved varieties of the Merisiers, the fruit being larger, sweeter, the flesh softer. Their second class, or Bigarreautiers, is synonymous with our Bigarreau, or heart-shaped Cherries; the flesh being sweet, crisp, and firm. Their third class of the Cerisiers includes all the Maydukes, Kentish, and Flemish Cherries; the flesh being soft, tender, juicy, and slightly acid. Their fourth class, the Griottiers, is synonymous with our Morellos.

Dr. Hogg, in the last edition (1884) of his Fruit Manual, makes eight divisions of Cherries:—

1. Black Geans.—Sweet, heart-shaped Cherries, with tender and dark-coloured flesh.

2. Red Geans.—Pale-coloured, sweet Cherries, with tender and translucent flesh and skin.

3. Black Hearts.—Dark-coloured, sweet Cherries, with flesh harder than Black Geans, but neither so firm nor crackling as that of the Bigarreau.

4. White Hearts or Bigarreaus, with red or light-coloured, mottled skin, and hard crackling flesh.

5. Black Dukes.—Dark skin and flesh, and deep-coloured juice.

6. Red Dukes.—Pale red, translucent skin and flesh, and uncoloured juice; otherwise closely allied to Black Dukes.

7. Black Morellos. — Dark-coloured fruit, with coloured acid juice; trees having long, slender, pendent shoots.

8. Red Morellos. — Pale red, acid varieties, of which the Kentish Cherry is the type.

Propagation.—This is by budding and grafting for the perpetuation of varieties, and by seeds for new varieties and stocks. Taking the last first, very few attempts are now made to raise improved Cherries. The seeds of Cherries, are, however, largely sown for furnishing stocks for established varieties, those of the wild Geans, Maydukes, Kentish, Morellos, being generally preferred for this purpose. Of late years another species, the Cerasus Mahaleb, has been largely raised from seeds and layers as a stock for the smaller, best and pyramidal forms of Cherry-trees. This forms a far better dwarfing stock than the Morello, and will probably prove almost as useful in dwarfing the stature and increasing the fertility of Cherries, as the Paradise stock has in insuring these most desirable conditions among Apples.

The best time to sow Cherry-stones is so soon as the fruit is ripe and eaten, or they may be pitted in sand or earth till the spring. Sow in any light friable soil, in drills eighteen inches apart, and two inches deep. The seeds should be sown rather thinly, and the plants may remain two years in the seed-drills or beds. Line out at the end of the second season at convenient distances for working or proving.

Budding and Grafting.—Dwarfs are best budded at from six to eighteen inches; orchard standards or other trees at from three to six feet from the ground. The best mode of grafting Cherries is a sort of hybrid between budding and grafting—that is, grafting or budding about midsummer, with the section of wood left intact. Thus grafted in summer, the union is speedily effected, and the result is almost as satisfactory in effecting a perfect union as budding.

Planting.—The Cherry, being an early tree, may generally be planted from the middle to the end of October. As to soil, the field that will grow good Wheat will generally grow good Cherries. In the olden times, when nearly all Cherries were worked on the Red or Black Gean, a good holding loam was

thought best for Cherries; with the Mahaleb and other dwarfing stocks, lighter soils have been introduced. Still, a sweet, fibrous, unctuous, hazel loam, with considerable staying or holding quality, is the best for Cherries. The Cherry being a deep and rather gross rooter, the border should be thirty inches or three feet deep.

The chief places for growing Cherries are orchards, parks, plantations, gardens, walls of gardens, and outhouses. In Cherry orchards the Cherries have, as a rule, all the ground to themselves. Nothing can exceed these in beauty, nor in profit in good seasons. In good orchards the distance apart may have a range as wide as from fifteen to fifty feet between the rows, and about half these distances from tree to tree in the rows. For the distance apart of pyramid bushes, espaliers, cordons, &c., see Apples and Pears.

As to the furnishing of walls, it is a good plan to plant Cherries on every available aspect. This simple plan extends the Cherry season at both ends. Of course, the more acid Kentish and Morello Cherries will be placed on east and north walls. These not not only ripen later and keep better on such, but are also of superior quality when grown in the shade.

Training of the Cherry.—Orchard Cherries, whether as standards or dwarfs, need but little training, and that of the same sort as described for Apples and Pears, of similar character. For walls and espaliers, there are but two forms and modifications of them practicable—that is, the fan and the horizontal, the former being far the best as a rule.

The training of most varieties of Cherry need not differ greatly from that of the Apple and Pear. Kentish and Morello Cherries on walls and espaliers, or in any form, should, however, be trained and pruned more like the Peach.

These varieties bear less on spurs than on the young wood of the past year, and the mode of training adopted must be such as to make ample provision of such wood, not only to replace that older and more exhausted, but to yield a full supply of fruit every year. But the best Geans, Dukes, and Bigarreaus may be moulded into pyramids, suppressed into dwarf bushes or cordons at will. Though the Morello does not take kindly to the cordon style, it forms model dwarfs of a semi-weeping character, about four feet high, and as much through. For such trees own-root Morellos raised from layers are to be preferred.

Pruning. — See that of Apples, Pears, and Peaches. The pinching and pruning should, however, be less severe for Cherries than for either of the others. The Cherry may be said to hate the knife, and after it is fairly started in the orchard, and the leading shoots are properly laid, prune not at all if you would gather Cherries year after year by sackfuls.

General Cultivation.—The precociousness of the flowering renders some protection to the bloom quite essential to success in many localities. Much may, however, be done to retard the blooming of the finer varieties, by planting them on east or north walls, and also by planting choice late cordon Cherries in the open, instead of, or in addition to, the same varieties on south or west walls or fences. However, a few boughs or some netting are well employed in protecting Cherry bloom from spring frosts.

Cherries, in dry localities, often suffer severely from dryness at the roots. Where the borders are well drained, no fruit-tree derives more benefit from floodings of sewage, or other liquids, than Cherries. Overhead watering, in the evening, also preserves the health of the trees, and greatly adds to the size of the fruit, and prevents fruit-splitting, which mostly results from heavy rains on the heels of drought. In good Cherry years, when the trees are heavily laden, heavy mulchings of manure or rich compost are of much service to the perfecting of the crop, and the preservation of the vigour of the trees.

Top-pruning has already been adverted to. As to root-pruning Cherries, unless absolutely necessary, the advice, Don't do it, is the best that can be given. Cherry-roots as well as tops are prone to gum and canker, if subject to anything like the amount of interference that may prove useful for Pears or Apples. Also all ties and shreds in nailing must be left sufficiently loose, so as not to cut into the wood on any account, else will gum and mildew be quickly developed.

The Thinning of the Crop.—This is, of course, impracticable on orchard trees, but is easily managed on smaller trees or on walls. It needs judgment and care, and only the experienced grower can tell what fruit to thin off, at the early period when alone thinning is useful to prevent the trees throwing off the bulk of the crop, as they not seldom do.

Protecting and Gathering the Fruit.—Where birds abound, the Cherries must be safely netted before they begin to turn, as if deferred till the fruit are ripe, there will be few or none to protect. With the exception of Morello Cherries, which improve by hanging on the trees for a month or two after they are ripe, all other Cherries should be gathered and eaten the moment they are ripe.

The mere act of gathering needs care and skill, as otherwise the fruit has such a firm hold, and is so closely mixed up, and often almost imbedded in the clusters of fruit-spurs, that not a few of the latter may be wrenched off in the gathering. A sharp knife or scissors is therefore most useful in gathering Cherries.

Diseases and Insects.—Gum and canker may be said to be almost the only maladies that affect Cherries. Both are preventible, although hardly curable. By pursuing the method of culture here briefly set forth, but little of either will appear.

Beware of excessive stimulations; gum has its origin in extravasated sap, and may be produced by excessive vigour, especially when exposed to sudden checks, or wounds.

Insects.—The worst of these is the black fly, *Aphis cerasus*, the strongest and the most destructive of the whole family, so often very troublesome alike in the spring, summer, and autumn. The simplest remedies are those already described—see the Peach and Nectarine.

In the case of larger trees, the chief practical difficulty is to reach the affected parts. Overhead syringing through the garden engine obviates this difficulty to some extent, but the expense of killing washes also deters from using them.

Fortunately the aphis mostly attacks the points of the shoots first, and if the latter can be promptly cut off as far down as the aphis extends, and the points carefully bagged and burned, there will mostly be an end of the black fly for the season. The caterpillar of the goat-moth, *Cossus ligniperda*, mostly confines its attention to the Duke class of Cherries. The slugworm, *Selandra atra*, is more catholic in its tastes, and proceeds to skeletonise the leaves to a ruinous extent. A strong dose of such compoundings as a pound of tobacco to four gallons of water, or a peck of lime and two pounds of soft soap to thirty gallons of water, or a pint of paraffin oil to a gallon of water, as thoroughly mingled as possible, generally finishes these pests, or makes them flit to sweeter quarters. These troublesome pests may also be pickled off by dustings of soot and quicklime, in equal parts, dosings of snuff or pepper, &c. (See also Pear and Peach Insects.)

Varieties of the Cherry.—Mr. Carmichael chooses the following dozen:—

SELECT LIST OF CHERRIES.

Ansell's—fruit very large; colour black; a delicious kind. August.

Archduke—fruit large, deep red, rich, and briskly flavoured. July.

Belle d'Orléans—fruit medium size; yellowish-white, juicy, and richly flavoured; one of the earliest and best kinds. June.

Bigarreau Napoleon—fruit large, and handsome; pale yellow, juicy, and richly flavoured; the tree is a great bearer. August.

Black Tartarian — fruit large, deep black, handsome, and first-rate; it ought to grow on a wall. Beginning of July.

Early Rivers—fruit large, black, and of first-rate quality. June.

Frogmore Early Bigarreau—fruit large, pale yellow, and first-rate flavour. July.

Mammoth—fruit large, and handsome; pale yellow; very fine. August.

Mayduke — fruit medium size; dark red; a well-known kind. July.

Morello—fruit medium size. The best for culinary purposes. July.

Reine Hortense—fruit large and handsome; a first-rate kind. End of July.

St. Margaret's—fruit very large, dark purple, sweet and rich. August.

OTHER FINE CHERRIES.

Bigarreaus.

Adam's Crown—early, pale red; first-rate.

Belle Agathe—flesh yellow, and sweet; the latest of all Cherries.

Buttner's Blackheart — larger and superior to the old Black.

Buttner's Yellow—very rich and sweet; of a pale amber when ripe.

Cleveland Bigarreau—yellowish-white, mottled with crimson, juicy, and very full-flavoured.

Couronne — dark purple, sweet and high-flavoured: one of the oldest and most popular orchard Cherries in cultivation.

Downton—delicious flavour, pale yellow, dotted with red.

Gascoigne Heart—one of the finest and most popular Cherries now in cultivation.

General Wood — new red American Cherry of the highest quality.

Late Bigarreau—yellow and red; flesh very rich.

Monstrous Heart — very large, the skin yellowish, changing to red.

Oxheart—flesh firm; dark red; very fine.

Tradescant's Heart—dark purple, firm, flesh sweet and brisk.

Geans.

Amber—rather small but fine, tender, juicy, delicate in appearance, and of the most delicious flavour.

Black Eagle—rich and delicious.

Early Purple — delicious, tender, and juicy; dark purple.

Hogg's Black—rich, sweet, and tender; flesh and skin very dark.

Hogg's Red—flesh yellowish-white, juicy, and highly flavoured.

Late Purple—this Cherry is about equal to the Early Purple but is much later, ripening in the end of July.

Manning's Mottled—yellow, transparent, juicy, and sweet.

Transparent Gean — pale yellow, mottled with red, sweet and sub-acid.

Waterloo — deliciously flavoured; one of the finest clear red Cherries.

Werder's Early (Black)—very large; deep colour, and most delicious flavour.

Maydukes.

Belle Magnifique — yellowish, tender, sweet and sub-acid; an immense bearer.

Buttner's October — rich red, veined with white; sparkling sub-acid.

Carnation — very prolific; flesh yellowish, tender, juicy, and sweet.

Late Duke—pale red, tender, and juicy. End of August.

Mayduke—still one of the most prolific and best; rich, tender, good flavour.

Reine Hortense—flesh yellow, netted, very tender, and sweet, with a dash of acid.

Transparent—dark purple, melting, and tender.

Morellos.

Flemish—very similar to the Kentish, but the tree is more upright.

Kentish—bright red, rather acid; of a semi-drooping habit.

Morello — tender, briskly acid, gaining colour as well as sweetness as it ripens.

Ostheim — new improved and larger variety of Morello, and less acid than the type.

The Cherry Season.—This, by making a careful selection from these lists of varieties, may be extended from June to November. By placing Early Gean and Werder's Early Black on south walls, they may be forced into ripening in May, and Morellos carefully matted or canvased over will hang on the trees till the end of the year, thus adding to the Cherry season a month at both ends.

Apart from these forcing and retarding expedients, the following come in during the seasons specified:—

June.—Early Rivers, Werder's Early Black, Early Purple Gean, Belle d'Orléans.

July.—Black Tartarian, Governor Wood, Elton, Early Frogmore, Black Eagle, Transparent, Monstrous Heart.

August.—Florence, Late Duke.

September.—Belle Agathe.

Kitchen Cherries.—The Morello, Kentish, and Belle Magnifique.

Cherries for Orchards.—For large trees to grow up to a considerable size, either as standards or dwarfs, with but little pruning or other interference, the following are admirable:—

Amber Gean, Belle Agathe, Buttner's Blackheart, Adam's Crown, Early Prolific, Elton, Mayduke, Late Duke, Black Tartarian, Bigarreau Napoleon, and Mammoth.

BULBOUS PLANTS.

By William Goldring.

Ixiolirion (*Ixia Lily*).—The Ixia Lilies are extremely beautiful, and unlike most other bulbous plants. They produce slender-branched flower-stems from one to two feet high, carrying numerous starry flowers of a violet-purple colour, varying in tone in the various kinds. There is such a similarity in the four so-called species, that for garden purposes they may be regarded as one. The names are *I. montanum* and *I. Pallasii*, from Syria; *I. Tataricum*, from North Persia; and *I. Ledebourii*, from Asia Minor.

Culture.—They require the general treatment of Cape bulbs, as they are not thoroughly hardy, although they take no harm in the open border in southern districts in light soil. As a rule, however, it is best to grow them either in frames, or to lift the bulbs in autumn, and re-plant in early spring. They thrive admirably in a sunny, well-drained border at the foot of a wall in light loamy soil. After they have flowered in summer it is advisable to place a hand-light over the bulbs, so as to keep them dry, and so conduce to their thorough ripening. They may be lifted in September, wintered in a cool place, and re-planted in March.

Lachenalia.—These pretty spring-flowering bulbs are invaluable for the green-house, being so bright and elegant, and so easy to grow well. It is a rather large genus, but the most beautiful species form a distinct group, numbering some half a dozen kinds. They all have broad and generally spotted leaves, and bear erect flower-spikes. The blossoms in all the species of this group are drooping, while those of most other species are borne erect. Of late years hybridists have produced some beautiful varieties, excelling the original in beauty. The following are among the most ornamental kinds of the drooping-flowered section. These for the most part are strictly regarded as varieties only of one type, the well-known *L. tricolor*, but for the garden they may be considered distinct.

L. aurea—like tricolor, but the flowers of a rich golden-yellow. Flowers in March and April.

L. luteola—flowers pale yellow, flushed with green. March and April. The commonest form.

L. Nelsoni—a new hybrid from L. aurea, from which it differs in being more robust in growth, and with larger spikes, and flowers of a richer and deeper yellow. From February to May.

L. pendula—a very handsome plant, one of the finest of all. It is more vigorous and has broader foliage than the others, and less spotted. The flower-stems bear from ten to fifteen drooping flowers of a rich ruby-red tipped with black.

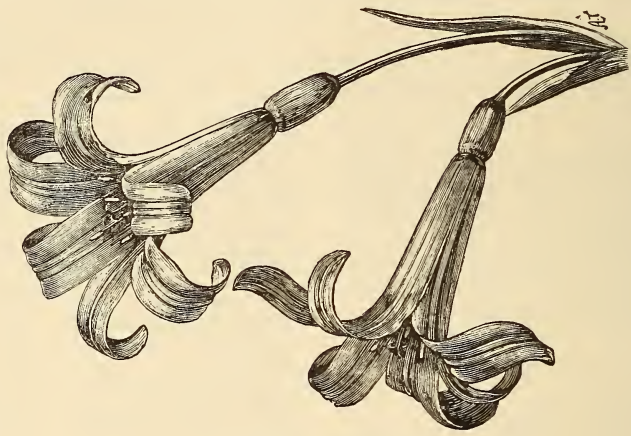
L. quadricolor—a variety of L. tricolor—is a beautiful plant. It is more robust than tricolor itself, and has larger blotches on the leaves and stems. The flowers are also larger, and they have four distinct colours — yellow, green, deep purple, and red. Flowers from mid-winter till late spring.

L. tricolor is the common kind, with flowers green, yellow, and red; foliage spotted with brown.

Among other species worth growing are *L. rubida*, *orchioides*, *L. stolonifera*, and *tigrina*. All the species of *Lachenalia*, numbering about thirty, are natives of South Africa, chiefly of the Cape of Good Hope.

Culture.—Lachenalias may be grown in a variety of ways—in pots and hanging baskets, in baskets, or planted out in frames. Pot-culture is best for producing fine bloom, while globular baskets, with the plants protruding through the wires on all sides, have a pretty effect. Those who have no green-house may grow them to perfection in unheated frames, either in pots or planted out. Plenty of light and air should be given them, and a decided rest after the foliage is down, during which period they must be kept quite dry. This resting season lasts till August, when the bulbs should be re-potted and started into growth. From the time of starting into growth, till all the foliage has died away, the plants should not be neglected. During actual rest the pots should be placed so as to have the benefit of the sun, in order to ripen the bulbs. Often the bulbs are too

much crowded in the pots, but three or four in a five-inch pot are ample, or single bulbs may be put in three-inch pots. The best soil is a compost of two parts of loam, two of coarse sand, and one part each of peat, leaf-mould, and well-decayed cow-manure. Water should not be given until growth commences. Instead of potting the whole stock at once, when it is large, a portion may be kept and potted a month or six weeks later, so as to obtain a successional bloom. By gently forcing a few of the earliest-potted bulbs, the flowering season may be extended from Christmas time till June. In basket-culture the bulbs should be planted all round the interior of the baskets. To prevent the soil from running through there should be a good layer of moss between the sides of the basket and soil. The bulbs produce an abundance of offsets, so that propagation by other means is unnecessary.



Ixiolirion Tataricum.

Leucojum (*Snowflake*). — The Snowflakes, like the Snowdrops, have been garden favourites for generations. They are all more or less hardy, but vary a good deal in constitution, some being weakly, others very strong in growth. *L. vernum* is the earliest to flower, and hardy enough to brave the cold and wet of February. It is somewhat like a Snowdrop, but the flowers are bell-shaped, and white, with each of the petals tipped with greenish-yellow. It grows from nine to twelve inches high. There is a larger and stronger-growing variety of it that habitually bears twin-flowered stems, and has the petals tipped with yellow. This is known as *L. Carpathicum*. This Snowflake (called also *Erinosma vernum*) is a native of moist pastures throughout Central Europe .It flourishes in an open sunny border of light, loamy soil.

The Summer Snowflake (*L. æstivum*) is much taller and more robust than the Spring one. The flowers, produced in early summer, are white and drooping, from four to eight on each stem. Two other Snowflakes very similar to this kind are *L. pulchellum* (which flowers about a month before *L. æstivum*), and *L. Hernandezianum*, characterised by its fewer flowers on a stem. These three kinds are natives of moist meadows and pastures throughout Central Europe, and are naturalised here. They are of easy culture, thriving in moist partially-shaded positions in almost any kind of soil. They are admirably suited for naturalising in moist woods, and on the banks and margins of lakes and streams, and are readily increased by separating the bulbs at almost any season. There are a few other species of *Leucojum*, once placed in the genus *Acis*, all natives of South Europe and North Africa. There they are of dwarf slender growth, with narrow, grassy foliage, and bear small, white, bell-shaped flowers on slender stems. The species of the *Acis* section now in cultivation are *L. autumnale*, *L. roseum*, *L. trichophyllum*, *L. hyemale*, and *L. grandiflorum*. These are all too delicate to be recommended for general cultivation, as they require great care and attention to succeed with them.

Lilium (*Lily*). —Lilies are so diverse in growth, stature, and colour, that they are equally well suited to the mixed border, the shrubbery, and the rock garden, while the tenderest kinds are valuable for the green-house. They range in stature from a few inches high, as in *L. alutaceum*, to as much as ten and twelve feet in *L. giganteum*, and some of the Californian species.

Of late years the number of cultivated Lilies has been considerably augmented, until now there are upwards of fifty species, with probably as many varieties. These have been culled from almost every region of the Northern Hemisphere, from Japan in the extreme east to California in the west, and from the hills of Southern India and the Philippines to the dreary plains of Siberia and the cold swamps of Canada. The head-quarters of the genus are Europe, Japan, and California; and the species from these regions are all hardy enough for our open English gardens.

All Lilies are herbaceous perennials; that is, their stems die down after flowering, and though the roots are active throughout the winter, no signs of growth

are visible above ground (except in the case of the common White, *Lilium candidum*) till the spring, when the flower-stem makes its appearance. The flowering season of Lilies extends over a period commencing from the beginning of June, when *L. umbellatum* and numerous varieties expand their blossoms, till the autumnal frosts clear off the last flowers of *L. speciosum*, *tigrinum*, and *auratum*, the latest being the Indian, *L. Neilgherrense*.

Lily-bulbs vary greatly in size and shape. The greater number are more or less globular, but several of the North American kinds, notably *L. superbum*, *pardalinum*, and *Canadense*, have bulbs in the form of creeping underground rhizomes.

Culture.—As many Lilies begin naturally to root directly the flower-stems have died down, it is obvious that autumn is the best time for planting, providing always that good bulbs are to be obtained then, but imported bulbs seldom reach this country before the end of the year. The common White Lily should be transplanted by the beginning of August, as growth re-commences soon after. Imported bulbs, when received, should be examined, and any decaying matter removed, and then placed in a spot sheltered from frosts or heavy rains, and just covered with sandy soil or fibre refuse kept slightly moist. Leave the bulbs in this state till the roots at the base start into growth, when they should be planted.

Pot-culture.—The kinds principally grown in pots are: *L. auratum*, *L. candidum*, *L. longiflorum* and its varieties, *L. umbellatum*, the varieties of *L. speciosum*, and *L. elegans* or *Thunbergianum*. The pot-culture of these different kinds is about the same in all. The bulbs are potted in good soil, consisting of loam, decayed manure, and sand. They are afterwards either placed in a cold frame or plunged out of doors till growth commences. They may then be either placed in a little heat, or not, according to the time their flowers are required. Copious supplies of water must be given when the pots are filled with roots. To this mode of treatment exception must be made in the case of *L. candidum*, as it needs to be grown in pots one year before flowers can be expected.

Propagation.—Lilies are propagated by various means, sometimes by breaking up and dividing the bulbs after flowering, and sometimes by the bulblets, which in some kinds are produced freely in the axils of the leaves. These bulblets root and grow when brought in contact with soil. The kinds producing long, fleshy, underground stems can be increased by cutting the long creeping root, or stem, into pieces, each of which will grow. Another mode, and one by which most Lilies are artificially propagated, is to detach some of the scales from the outside of the bulb, which is not in any way injured if the operation be carefully performed. These scales are then placed in a frame, or in the open ground, and covered with soil after the manner of sowing seeds.

Species and Varieties.

The fifty odd species of *Lilium* at present known to botanists are arranged into five groups. First, *Cardioerinum*, characterised by broad heart-shaped leaves, as in *L. giganteum* and *cordifolium*. Secondly, *Eulirion*, or True Lilies, including about a dozen species, the common White Lily (*L. candidum*), and *longiflorum*, being in the group. Thirdly, *Arehelirion*, numbering some four or five species, including *auratum*, *speciosum*, and *tigrinum*. Fourthly, numbering about a dozen species, among which are the common *umbellatum*, *croceum*, and *elegans*. Fifthly, *Martagon*, the Turk's Cap Lilies, which is by far the largest group, and comprises the whole of the species not included in the other four groups. The common Martagon Lily is the type of this group, and such as *pomponium*, *Chaleedonieum*, *pardalinum*, *Canadense*, and *superbum* are also included in it. The cultivator groups them according to their requirements. Thus, he has shade-lovers, sun-lovers; those that thrive best in peat, others best in loam; those that like a dry situation, and those that delight in moisture.

L. auratum—regarded as the queen of Lilies—is imported in large quantities every year from Japan. The large bold flowers have usually a white ground, with a golden stripe on each petal, and studded more or less with rich crimson dots. Cruentum has deep crimson stripes instead of yellow, and pictum is similar but inferior to cruentum. In virginale the flower is wholly white, except a pale golden stripe, while Wittei is spotless white, and platyphyllum has leaves twice as broad as the ordinary type, and bears large massive white blooms, banded with yellow.

L. Batemannæ—a Japanese kind growing about a yard high, having clusters of cup-shaped blossoms, of a bright apricot tint; produced in July.

L. Brownii—a very beautiful Lily, producing large solitary trumpet-shaped blooms; pure white inside and chocolate without. This Lily requires a well-drained sheltered spot.

L. bulbiferum — has cup-shaped, deep red blooms; very hardy, and one of the earliest to flower. Europe.

L. Canadense — the Canadian Lily—is of slender growth, and bears turban-shaped blossoms. They vary in colour from yellow (flavum) to red (rubrum).

L. candidum—the spotless purity of its blossoms, and their fragrance, make this Lily a favourite of every one. It succeeds best in good stiff loam, and should be allowed to remain undisturbed. The varieties are spicatum, a monstrosity in which the blooms are replaced by a spike of greenish-white bracts; striatum, with the flowers tinged with purple, and a variegated-leaved kind.

L. Chalcedonicum—the vivid vermilion of this Lily renders it one of the showiest of all. It is very hardy, and thrives well in any garden. Like the White Lily, it will often grow but little the first season after planting. It flowers about the end of July.

L. croceum — the Orange Lily—bears large clusters of erect orange-coloured flowers, about the beginning of July. It is a native of Central Europe, and for the open border or shrubbery margin is one of the best.

L. elegans—an early-flowering Japanese Lily. The stem is not more than a foot high, and in some varieties much less, and is terminated by several

large, upright, cup-shaped blooms. There are many varieties, the best being alutaceum, the Prince of Orange, atrosanguineum, Marmoratum, Van Houttei, bicolor, and staminosum.

L. giganteum — the Giant Lily — distinct from all others, has heart-shaped leaves, and a towering flower-spike. The flowers are from six to twelve inches long, and white, tinged with purple and green. It is a native of the Himalayas, and it is fairly hardy in some parts. The huge bulbs are completely exhausted after flowering, and decay, leaving two or three offsets at the base of each stem, which take some years to attain flowering size.

L. Hansonii—a beautiful Lily, resembling the common Turk's Cap, but with more wax-like blossoms, of an orange-colour, dotted with brown. It is a vigorous, hardy kind.

L. Humboldti — a Californian Lily. It reaches a height of six feet or more, and bears a number of gracefully reflexed golden blossoms, spotted with brown. A loamy soil suits it best.

L. Kramerii — one of the loveliest of Japan Lilies. From a small bulb it pushes up a slender stem, which bears one or more very long flowers of an open funnel shape, being six or eight inches long, and of a delicate lilac-pink colour. For pot-culture it is a charming Lily; indeed, the most satisfactory way to grow it is in pots.

L. Leichtlinii — a slender and graceful species, resembling the Tiger Lily, but less robust, and the flowers are of a pale yellow, dotted thickly with brown. It is from Japan, and though quite hardy, is in many places difficult to keep in good health.

L. longiflorum—this is the long-flowered, pure white Lily, so commonly sold in pots by florists. In the open border it blooms at the end of July. Among the varieties the best are albo-marginatum (leaves are margined with white), eximeum, Takesima (slightly tinged with purple), and Harrisii, very prolific in flower, which it produces two or three times during the year.

L. Martagon—one of the commonest of garden plants; quite naturalised in some parts of the country. The most distinct varieties of it are album; Dalmaticum, blackish-purple; and flore-pleno, with double flowers. All thrive in ordinary soil, in sun or shade.

L. Neilgherrense—the handsome Neilgherry Lily—has large funnel-shaped flowers, of a primrose colour, and often a foot in length. It is essentially a greenhouse Lily, requiring pot-culture.

L. pardalinum—the Panther Lily of California—is a showy species of noble growth. The blooms are turban-shaped, of a bright red colour, with the lower part of the petals orange. In the variety Californicum or Robinsonii, the red is replaced by a brilliant scarlet, both having the blooms spotted with purple, while pallidifolium is yellower. It flourishes well under ordinary conditions in the open border, and will thrive in moister soil than most of the others. It delights in a peat soil in a partially shaded spot, and flowers in July.

L. Parkmannii—a splendid Lily, said to be a hybrid between L. auratum and speciosum. It is quite intermediate between these two kinds, combining the large flowers and rich colouring in a beautiful way. It is very rare.

L. Parryi—a graceful Lily, with funnel-shaped blossoms, borne on long slender stalks, and pale yellow. A native of California. Is quite hardy, and thrives best in a peaty soil.

L. parvum—a pretty, small-flowered Lily, with pendulous yellow blossoms, dotted with brown. The bulb is creeping, and the flower resembles L. Canadense.

L. Philadelphicum has a bulb smaller than any other Lily. Its slender stems produce large erect blossoms, of a bright orange-red colour. It is by no means of easy culture. It succeeds best in a light vegetable soil, and in a partially shaded position. A native of the United States.

L. Philippinense — one of the noblest of all Lilies—is similar to L. longiflorum, but the leaves are much narrower, and the flowers longer. It needs a warm green-house to grow it successfully. A native of the Philippines.

L. polyphyllum—a pretty and distinct Lily; bears several flowers, of a pale yellow ground-colour, thickly dotted with purple. Though a Himalayan plant, it is fairly hardy in England.

L. pomponium — a well-known European Lily, growing from two to three feet, the flowers being numerous, and in shape like those of L. Martagon. The flowers range from orange to bright vermilion, and have a disagreeable odour.

L. pulchellum—a miniature Lily, growing about a foot high, with erect flowers, of a bright red colour. It flowers in June. It is the prettiest of the early Lilies and flowers freely when planted in a border under a hand-light or frame. Native of Siberia.

L. rubescens—a Californian Lily, with small purplish flowers. It is not easy to cultivate, the most successful results being obtained in a stiffish well-drained soil.

L. speciosum—the common green-house Lily, often erroneously called L. lancifolium. It is one of the most beautiful of Lilies, and is particularly suitable for green-house cultivation. It is not sufficiently hardy to be grown out of doors generally in this country, as it flowers so late. There are many forms, the best being album, Krætzerii, roseum, rubrum, Schrymakersii, and punctatum. Besides these there are album monstrosum, and rubrum monstrosum, in which the flowers are collected into a flattened head. Native of Japan.

L. superbum—the Swamp Lily—is unlike most of the others, as it will grow in damp spots, being found naturally in marshy places. It grows six or seven feet high, with as many as twenty flowers on a spike. The blooms are turban-shaped, orange-red, and spotted. Flowers about August. North America.

L. Szovitzianum—the Caucasian Lily—is found in gardens under the names of L. Colchicum, and monodelphum, as well as that of L. Szovitzianum. It is one of the finest of all, and being hardy, it forms a stately object in a border. The stem rises from four to six feet in height. The large turban-shaped flowers are pale yellow, with small blackish dots; they vary in tint, some being spotless. It flowers about the end of June. It prefers a good free soil, but when planted the bulbs generally remain dormant, or nearly so, the first season.

L. tenuifolium—a Siberian species; a good deal like L. pomponium, but smaller in all its parts. The flowers are bright crimson.

L. testaceum—a most beautiful Lily; said to be a hybrid between L. candidum and L. Chalcedonicum. It is like L. candidum, but the flowers are more open and of a nankeen tint. It requires a good rich soil.

L. tigrinum—the common Tiger Lily—flowers in the autumn after most of the others are past. There are several varieties, the best being splendens, which is the latest in flowering; Fortunei, an early blooming form; and flore pleno, with double blossoms.

L. umbellatum—under this name are included various Lilies, producing large cup-shaped blossoms early in the season. They are sometimes classed as variations of L. Davuricum, but are quite distinct from the ordinary form of that Lily. The showiest are Sappho, incomparabile, grandiflorum, and erectum. They are all vigorous varieties, suitable for the open border.

L. Wallichianum—a Himalayan species in the way of L. Neilgherrense, but more slender, and with almost white blossoms. It requires the protection of a green-house, and cannot be included among easily-grown plants.

L. Washingtonianum — a grand Lily, but unfortunately seldom seen in a flourishing condition in England. It has whorled leaves, and strong plants bear as many as twenty blossoms, their colour being a pale lilac. Good sandy soil, with thorough drainage, should be given to this Lily. A native of California.

Besides the foregoing kinds there are a few more that are occasionally met with, but are seldom satisfactory, so that a mention of their names will suffice here. Among them are:—*L. avenaceum*, *callosum*, *Catesbiæ*, *Columbianum*, *concolor*, *cordifolium Coridion*, *medeoloides*, and *Partheneion*.

Merendera.—This genus is a near ally of *Colchicum* (Meadow Saffron). The best-known species,

M. bulbocodium, strikingly resembles the common *Bulbocodium vernum*, but whereas the *Bulbocodium* flowers in early spring, the *Merendera* blooms in autumn. The flowers are bright rosy-lilac colour, and being showy are welcome during the autumn. It is a native of the Pyrenees, and is quite hardy. The flowers appear before the leaves, as in the case of the *Colchicum*. The other species are unimportant. They are *M. Caucasica*, also known as *Bulbocodium trigynum*, and *Colchicum Caucasicum*; *M. sobolifera*, and *M. filifera*, both autumn-flowering.

Milla.—There are several Liliaceous plants known in gardens under the name of *Milla*. These variously belong to three distinct genera—*Milla*, *Brodiæa*, and *Triteleia*. There is strictly but one *Milla*, and this is *M. biflora*, a beautiful Mexican species. It is a slender plant, bearing star-shaped flowers of waxy texture, and pure white, produced in summer. In any but the most favoured spots this plant requires protection to grow it well, either in pots, in a green-house, or frame, or planted out in a light soil in a frame. It likes a light loamy soil and plenty of sand about the bulbs.

Montbretia.—A small genus of Cape of Good Hope plants of the *Iris* family, allied to *Tritonia*. The most familiar species is *M. Pottsii*, which is like a *Gladiolus* in growth. It produces numerous tall, slender, and often branching flower-spikes, furnished with two rows of bright red blossoms, which expand in quick succession from the base to the tip. It flowers during August and September, and a good-sized tuft of it in a garden is very showy. It is a perfectly hardy plant, and flourishes best in a warm sunny border of light sandy loam. It may also be grown successfully in pots for conservatory decoration during autumn, treated like pot *Gladioli*. It is propagated by offsets or bulblets detached from the parent bulbs in winter.

There are a few other species of *Montbretia* occasionally to be met with in botanic gardens, among them being *M. securigera* and *M. rosea*, both pretty plants, but too rare for general cultivation. A pretty hybrid, named *M. crocosmæflora*, has been raised between *M. Pottsii* and *Tritonia aurea*.

Moræa.—A large genus of beautiful plants of the *Iris* family. There are about three dozen species, but only a few are in gardens. They much resemble the *Irises* in growth and form of flower, and may, indeed, be called African *Irises*, as the majority inhabit the Cape of Good Hope. They are not, however, important plants, as their flowers are so fugitive, lasting only about a day, though one plant will bear several in succession. The best-known kinds are: *M. papilionacea*, a dwarf plant with most lovely pale mauve flowers; *M. edulis*, a very old plant, also very beautiful; *M. spathacea*, also known as *Dietes Huttoni*. *M. ramosa* and *M. ciliata* are among the other cultivated kinds which may be found in botanical collections; and, lastly, there is a *M. Sisyrinchium*, a veritable gem, but most commonly grown as *Iris Sisyrinchium*. It is a native of South Europe, and grows but a few inches high; the flowers, large for the size of the plant, are Iris-like, and of a charming lilac, blotched with white. It is so beautiful as to merit attention from all who have a green-house. It is a delicate plant, and requires careful pot-culture in an unheated frame or green-house. It does not like heat, and only needs protection from frosts. The secret of growing it well is to thoroughly ripen the bulbs by exposure to sun. The other *Moræas* above-mentioned are frame or green-house plants needing pot-culture, and being natives of the Cape, they require similar treatment to that recommended under the head of Cape bulbs.

Morphixia.—*M. paniculata* is a very beautiful plant, resembling an *Ixia*. The flowers have long tubes, and are produced abundantly in large, branched clusters. They are a soft buff, with a carmine centre, but this colour varies in the sorts from white, with a dark centre, to a rosy and apricot hue. It flowers later than the *Ixias*, and continues till August. It is known also as *Ixia paniculata*, *I. longiflora*, *Gladiolus longiflorus*, *G. ixioides*, and others. Other but unimportant *Morphixias* are *M. capillaris*, *incarnata*, *linearis*, *aulica*, and *odorata*. Only *M. paniculata* can be procured through the ordinary channels. All the *Morphixias* may be grown under precisely the same treatment as that accorded to *Ixias*, *Sparaxis*, and the like.

Muscari (*Grape Hyacinth*).—The Grape Hyacinths are spring-flowering bulbs peculiarly distinct from all others. They have conical flower-spikes, varying from deep purple to blue and white. They are capable of producing pretty effects in the spring garden if planted in large masses, for then their crowds of flower-spikes, though small, render a border aglow with rich blues of every shade. They are suitable for every garden in town or country, as the majority are not at all fastidious as regards soil; in fact, as a rule, many of them grow and increase so rapidly that they become weeds. All the species that are worth growing are thoroughly hardy, delighting best in a light deep soil, in an open sunny spot; and some of the rarer and more delicate kinds may be grown in the rock garden. Some,

however, such as the common *M. racemosum*, may be grown in shade, and under trees, and are therefore suitable for planting in masses in the wild garden. Once planted in a suitable spot, they do not want to be lifted for several years, and only then if the offsets are required for increasing the stock. The most prolific species, however, seed themselves so freely, and propagate themselves so rapidly by bulblets, that it is necessary in mixed borders to lift the bulbs, re-plant the largest, and throw away the rest about every third season. September and October form the best planting-time for Grape Hyacinths; or, in fact, the sooner after the leaves have died down the better. Seeds of the rarer kinds may be collected, and sown as soon as ripe in a frame, and the seedlings will flower about the third season. There are many species of *Muscari* known to botanists, but only about a score are worthy of the gardener's attention, and there is such a strong family likeness among these that it requires a practised eye to detect the differences between the so-called species.

The following are among the best kinds, and as they so nearly resemble each other, no description is necessary:—

M. Armenaicum—late, one of the finest.
M. Atlanticum—early and fragrant, clear blue.
M. botryoides, and varieties album and pallidum.
M. comosum monstrosum—large feather-like spikes.
M. Heldreichi—clear blue, one of the earliest and prettiest.
M. moschatum—the flowers are not showy, but musk-scented.
M. neglectum—one of the darkest blues.
M. pallens—pale blue.
M. racemosum — the common deep purple kind.
M. Szovitsianum—large, and rich in colour, one of the finest.

Narcissus (*Daffodil*).—There is now such a bewildering variety of *Narcissi*, that only specialists can hope to grasp the subject thoroughly, although, if one knows the principal types or sections under which all the varieties are classified, a fair start may be made in studying them; therefore it will be advisable to explain the principles of the classification now generally adopted in this country.

The genus primarily contains about two dozen species, all distinct in themselves; and these fall under three main divisions based upon the relative size of the corona, or cup, of the flower, which it need scarcely be said exists in every true *Narcissus* flower. These three divisions, therefore, are *Magni-coronata*, or large crowns, in which the crown or trumpet is as long, or longer than the divisions (sepals) of the flower. The kinds belonging to this division are popularly called Trumpet Daffodils, inasmuch as the crowns, or cups, of the flower are always trumpet-like. The common native Daffodil of the woods is a familiar example of this division. The second divison, called *Medio-coronata*, or medium-sized crown, is characterised by the crown being only about half as long as the sepals. The common Peerless Daffodil (*N. incomparabilis*), with its numberless varieties, is a familiar example of this division. The third division, *Parvi-coronata*, or small-cupped, embraces all those kinds in which the cup is very small, sometimes almost absent. The Poet's Narcissus, and the Polyanthus Narcissus, comprise the bulk of this division.

Selection of Varieties.

As in the case of other genera embracing numberless forms, for which there does not exist a standard list of names, it is a difficult matter to name a selection of what are considered the best sorts, because the names under which the varieties are known in one part are different in another; and more than this, the names in the catalogues of the chief London bulb houses do not correspond. The catalogue generally adopted is that issued by the Messrs. Barr, of Covent Garden, who have done with the *Narcissi* what the Kelways have done for the *Gladioli*, and Veitch for *Amaryllis*. Taking Barr's catalogue then for a guide, it may be useful to some if a few of the best sorts in the various sections are enumerated.

Hoop Petticoat Daffodils (*N. bulbocodium*).—The Hoop Petticoat Daffodils were formerly classed in the genus *Corbularia*, and have the cups of the flowers very large, while the sepals are small. They are all of dwarf growth, with grassy foliage, and their flowers vary from bright yellow to sulphur and white. Being natives of South Europe they are not so hardy as other Daffodils, and some even require pot and frame culture. The chief kinds are:

Bulbocodium (typical)—flowers small, bright yellow; very narrow, deep green leaves, hence the name tenuifolius, by which it is also known. Nivalis is similar.
B. citrinus—flowers about as large as in conspicuus, but of a soft primrose-yellow colour; a very choice and beautiful variety, both for open border and pot-culture. Graellsi is similar in colour, but smaller, and more delicate in growth.
B. conspicuus—the finest of the group. Flowers thrice the ordinary size, bright yellow, taller in growth, and very robust. Gigas is similar. Capital for pot-culture, for which purpose bulbs are largely imported; makes a most effective green-house plant, but is hardy enough for outdoor culture.
B. monophyllus — known also as Clusii and albus, is the lovely white Hoop Petticoat Narcissus of Algiers. It is of medium size, and the flowers are of silvery whiteness. A most charming plant, worth much trouble in growing well. Flowers in winter and early spring. Requires to be grown under a cold frame or hand-light on raised beds, the secret of success being in ripening the bulbs after flowering. White or pale yellow varieties are also those named albicans and Cantabricus, neither being so desirable as monophyllus.
B. serotinus—the latest to flower of the group; the flowers large, rich yellow, with long, recurving leaves. Obesus, lobulatus, and aureus are similar, but earlier-flowering.

Trumpet Daffodils.—This section comprises a large proportion of all cultivated Daffodils. They

have the cups of the flower long, often much exceeding the length of the sepals. The group, for convenience sake, may be subdivided into several sections, according to the colours of the flowers. In some cases the cup, or trumpet, is of the same colour as the sepals, in the majority it is darker, and in some, as bicolor, the trumpet is yellow, and the sepals white.

Common Daffodil Group (*N. pseudo-Narcissus*).—In all these the trumpet is yellow, the sepals paler, sometimes approaching white. These are *albus luteus*, *Nelsoni*, *pallidus*, *Scoticus*, and *variformis*. These do not differ much from the common native Daffodil, but are more desirable for the garden, *albus luteus* and *Scoticus* being the best. Belonging to this group are also curious sorts like *abscissus*, *hexangularis*, and *pumilus*. There is also a group of sorts similar to these, but larger, of which the Dutch *Daffodil princeps* is the type. Other good sorts of the *Princeps* group are *Cambricus*, *lobularis*, *ampli-corona*, *nobilis*, Wolley Dod, F. D. C. Godman, and *Telamonius*.

The *Major Group* is the most numerous of all the groups, and comprises the best of the yellow-flowered varieties, ranging from the giant *maximus*, which has its large, bright yellow flowers borne on stems not seldom a yard high. All the varieties in the group have large flowers of a uniform yellow, so, as may be imagined, the distinguishing points of the sorts are in most cases but slight. A selection of two dozen sorts in the group would include the following:—

Captain Nelson.
Chinese Gordon.
G. H. Engleheart.
Gladstone.
Her Majesty.
Hudibras.
J. G. Baker (volutus).
John Bright.
John Nelson.
John Vincent.
Little Princess.
Major (type).
Major superbus.
Maximus (the largest of the group).
Morning Star.
Mrs. S. Hibberd.
Obvallaris (Tenby Daffodil), distinct from all others, and one of the earliest to bloom.
Propinquus.
Shirley Hibberd.
Spurius.
Spurius coronatus.
T. Boscawen.
Thomas Moore.
Tottenham Yellow.

Narcissus Bulbocodium.

Emperor Group. — The variety which gives the name to this group is a noble-flowered kind, the flowers being large, the sepals broad, the cup long and wide. The sepals are pale yellow, the cup deeper. All the varieties in the group partake of the character of the Emperor. A selection of the best sorts would include:—

A. F. Barron.
Emperor.
J. W. H. Barr.
Lady Dorothy.
Lord Derby.
Mrs. W. Goldring.
P. R. Barr.
Rugilobus.

Bicolor Group.—In this the flowers are of two tints, the sepals white or very pale yellow, and the cup of a much deeper shade. All the sorts may be known also by the foliage being broader. The choicest, as well as the most popular, are Horsefieldi and Empress, both of which have very large flowers, with broad white sepals, and open cups of gold. In

addition to these fine sorts there are about two dozen distinct sorts in the group, the best being :—

Alfred Parsons.	Harrison Weir.
Bicolor (original).	J. B. M. Camm.
Charles Dickens.	Michael Foster.
Dean Herbert.	President Garfield.
Duchess of Edinburgh.	Prince of Wales.
Grandis.	W. Robinson.

White and Sulphur Group.—This is a large group, all the members of which have either silvery-white or sulphur-yellow trumpets, and sepals of the same tint or lighter. They have doubtless sprung from such wild species (or varieties) as *cernuus*, *tortuosus*, *albicans*, and *moschatus*, but these have become so intercrossed that it is difficult to single out the originals. All are beautiful, and the group includes about two dozen sorts. The best twelve are :—

Albicans.	Mr. Cowan.
Cecilia De Graaf.	Mrs. Burbidge.
Cernuus, and double form.	Moschatus.
Cernuus pulcher.	Rebecca Syme.
Exquisite.	Tortuosus.
F. W. Burbidge.	William Goldring.

To this group also belongs a beautiful new and early Daffodil from the Pyrenees, named *Pallidus præcox*. The flowers are of fine form, above medium size, and of a delicate straw-colour. It is the earliest to bloom of all the Daffodils; in mild seasons about London it is in flower in February.

The *Minor Group* has for its type the small early-flowering variety once ranked as a distinct species. It is dwarfer in growth than the common native Daffodil; the flowers are smaller, and produced much earlier. There are two distinct forms of it, one called *pumilus*, a stronger grower than *minor* itself, and *nanus*, which is very dwarf, the whole plant being only about six inches high, while the flowers nod prettily, almost touching the ground. Smaller still than these is *minimus*, the smallest of all Daffodils.

Chalice-crowned Daffodils.—This section includes all those *Narcissi* which have the cups of the flowers about half as long as the sepals; therefore it is intermediate between the Trumpet and the Poet's sections. The most familiar example in the section is the common Peerless Daffodil, *N. incomparabilis*, of which there is now a bewildering list of varieties. This group is called *Queltia* by some. Then there is the Cyclamen-flowered, or *Ganymede* section, and the hybrid races *Barri*, *Leedsi*, *Humei*, *Backhousei*, *Nelsoni*, and others, all of which are characterised by having medium-sized flower-cups.

Incomparabilis Group.—The varieties of this group being so numerous may be conveniently divided into sub-groups, based upon the colours. Of these sub-groups there are about half a dozen each, embracing numerous sorts differing slightly in tint, the best of which are enumerated below.

1. *Concolor.*—Sepals and cup yellow, the latter with little or no rim of orange. The best sorts are:—

Autocrat.	Jenny Lind.
Edward Hart.	Provost.
Frank Miles.	Sunray.

2. *Leedsi.*—Sepals and cup yellow, the latter with a distinct rim of orange-scarlet.

Fairy.	Mrs. A. F. Barron.
Figaro.	Titan.
Gloria Mundi.	Winslow.

3. *Sulphureus.*—Sepals sulphur-yellow, cup deep yellow.

Beauty.	J. F. Meston.
Darling.	Nabob.
Hogarth.	Queen Mab.

4. *Albidus.*—Sepals straw-tinted, cup yellow.

Albert Victor.	Lorenzo.
Cupid.	Mrs. Syme.
Cynosure.	Primrose Gem.

5. *Pallidus.*—Sepals primrose, cup yellow.

Pericles.	Princess Mary.
Prince Teck.	

6. *Albus.*—Sepals white, cup pale yellow.

Claribel.	Harpur Crewe.
Consul Crawford.	Mary Anderson.
Dr. Gorman.	Stella.

7. *Giganteus.*—Flowers very large, sepals and cup yellow.

Sir Watkin.

Barri Group.—A hybrid race, between *N. poeticus* and *Incomparabilis*. The varieties most resemble the latter species, and some are very beautiful. They may be classified in the same manner as the *Incomparabilis* group, according to the colour of the sepals and cups.

1. *Barri.*—Sepals and cup yellow.

Albus Beauty.	Golden Gem.
Conspicuus, very fine.	Lass of Gowrie.
Conspicuus minor.	Minor.

2. *Sulphureus.*—Sepals primrose, cup yellow.

Amy.	Milton.
Imogene.	Prince Bismarck.

3. *Albidus.*—Sepals sulphur-yellow, cup white.

Ada.	M. Vilmorin.
Cinderella.	Sylvia.
Gazelle.	Vivian.

4. *Albus.*—Sepals pure white, cup yellow.

Desdemona.	Lady Gray.
Dorothy Wemyss.	Sensation.
Flora Wilson.	Silver Star.

Leedsi Group.—A hybrid race between *N. montanus* and either *pseudo-Narcissus* or *Poeticus*. All very delicately-toned varieties, chiefly white, but some of them a canary-yellow. There are upwards of fifty sorts now included in it, the best dozen being :—

Alexis.	Ianthe.
Amabilis.	Katherine Spurrel.
Duchess of Brabant.	Leda.
Elegans.	Minnie Hume.
Flora.	Mrs. Langtry.
Gem.	Superbus.

The *Humei*, *Vincenti*, and *Backhousei* races have also affinity with *Incomparabilis*, and all are pretty varieties. The *Nelsoni* group is related to *N. Macleaii*, a variety with flowers like *bicolor* in miniature.

Among other Chalice-crowned Daffodils not included in the foregoing groups, but which are most desirable for cultivation, are the well-known *odorus*, with its varieties the double *Campernelli*, *rugulosus*, *lætus*, and *minor*. These are all of a bright yellow, and make showy border flowers. Then there is the pretty little *juncifolius* and the Jonquil; likewise the Cyclamen-flower, *triandrus*, and its varieties, which, however, are all too delicate for general open-air culture. They should be grown either in pots or planted out in frames. There is also a group of twin or triple-flowered varieties, called *Didymus* and *Tridymus* groups.

Poet's Daffodils.—These are comprised in the class called *Parvi-coronata*, as all have small crowns or cups, in some cases almost suppressed. There are three large groups in the class:—*Poeticus*, *Burbidgei*, and *Tazetta*, or Polyanthus, and others of less importance.

The *Poeticus* must be known to every one, the common Pheasant's Eye Narciss being the type. There are a good many varieties: all have pure white flowers, with coloured cups, and some are early, the rest late-flowering. The early sorts, which bloom in March and April, are *angustifolius*, *ornatus*, *grandiflorus* (the largest-flowered), *poetarum*, and *tripodalis*. The later sorts, flowering in May, are chiefly the typical *poeticus*, *recurvus*, and *stellaris*, all first-rate kinds. Last of all to flower is the double *poeticus*, a most desirable bulb, so pure in colour, and so fragrant.

The *Burbidgei Group* is very pretty, being the result of intercrossing *poeticus* with some other species. They differ chiefly from ordinary forms of *poeticus* in the sepals being yellow, and the cup highly coloured, but the form of the flower is much the same. Though quite a new race, there are upwards of fifty named sorts. A dozen of the best includes:—

Alice Barr.	Mercy Foster.
Baroness Heath.	Robin Hood.
Conspicuus.	Sulphur Star.
Edith Bell.	Thomas Moore.
Mary.	Vanessa.
May.	Wallace.

The *Tazetta Group*—or Polyanthus Daffodils, as they are commonly called—is important, inasmuch as it is the principal class adapted for pot-culture and for forcing into flower early.

There are numberless varieties, all characterised as having small flowers, gathered in bunches, and strongly perfumed. There are many wild varieties of the species, and nearly all these may be found among the Dutch varieties bearing popular names. The sorts may be divided into two sections, one in which the flowers have white sepals and orange cups, the other in which the sepals are yellow and the cups orange. The best of the white kinds are:—

Bazelman major.	Louis le Grand.
Gloriosus.	Paper White—or Papyraceus—which has small flowers wholly white.
Grand Monarque.	
Grand Primo.	
Grootvoorst.	Sir Walter Scott.
Her Majesty.	Staten General.

The best of the yellow-flowered sorts are Aureus, Bathurst, Jaune Suprême, Lord Canning, Chrysanthus, Grand Soleil d'Or, Intermedius, and Sir Isaac Newton.

Double Daffodils are numerous, every section being represented by some double sorts. In the Trumpet Daffodils there are large and small double yellows, those named *Telamonius plenus*, *plenissimus*, *grandiplenus*, *capax plenus* (Queen Anne's Daffodil) being the best. The double white sorts are extremely handsome, particularly the double *cernuus*. Among the double *Incomparabilis* varieties, the best are those called Codlings and Cream, or Sulphur Phœnix, Butter and Eggs, and Orange Phœnix. These three sorts represent all the beauty of the doubles. Following this are the double *N. odorus*, a pretty plant, and the double *poeticus*.

Culture.—The majority of the Daffodils can be grown successfully in the open in almost any kind of soil and situation, though of course, as with other plants, there are conditions under which they thrive best. The most suitable soil for a general collection is a moist, yet sandy, loam of good depth, moderately enriched with manure. A moist subsoil is especially favourable for most of them, and the best situation is one that, while it is exposed to full sunshine, is sheltered from the bleak, cold winds of early spring, when the plants are in bloom. The strong-growing kinds, such as those of the Trumpet, *Incomparabilis*, and *Poeticus* groups, all accommodate themselves to almost any position. They thrive on open hill-sides as well as in woodlands, and for planting on the margins of shrubberies, in woodland walks, margins of lakes or streams, there is not a more valuable class of bulbs. Those who make a speciality of the Daffodils grow them in beds expressly prepared for them, but they do not equire even this attention to bring them to perfection, as the mixed border will produce as fine blooms as specially prepared beds. The more delicate kinds,

such as the Hoop Petticoat group and the Polyanthus varieties, do need some attention paid as to soil and position, for they are only satisfactory when in warm spots in light soil, and there is no better place for them than a border at the foot of a south wall.

Daffodil bulbs do not require to be lifted annually; on the contrary, they succeed best when left undisturbed for at least three seasons. When it is found that the plants become less vigorous, and diminish in size, that is a sign that they require a change of soil, and the bulbs should, therefore, be lifted, separated according to their sizes, and re-planted immediately in newly prepared ground. This should be done after the foliage has quite decayed, which is generally about August. There is nothing gained by keeping the bulbs out of the ground longer than is necessary to dry them sufficiently to enable one to clean them. Of course, for purposes of sale, they must be kept out of the ground, and it is this protracted dryness that weakens the bulbs. When purchasing Daffodils it is best to get them as early in September as possible, and plant at once, no matter what class of Daffodil it is, for the bulbs commence to grow almost as soon as planted, and then they make good growth before the winter sets in.

Pot-culture of any other class of Daffodil but the Polyanthus or Dutch varieties is not commonly practised, although it may be desirable to grow some bulbs in pots for conservatory decoration in spring. But the Trumpet and other groups beyond the Polyanthus do not readily lend themselves to forcing into early bloom. The Polyanthus varieties are easily grown and flowered well, if a similar course is adopted to that recommended for Hyacinths and Crocuses.

TREES AND SHRUBS.

By George Nicholson.

Ostryopsis Davidiana is the only species of the genus, and is nearly allied to the Ostryas. It is an ornamental deciduous shrub, with leaves much like those of the common Hazel-nut in outline, but with veining more like that of the Hornbeam. The specific name was given in honour of the Abbé David, to whom European gardens are indebted for a large number of Mongolian plants.

Oxycoccos.—This genus is represented in the British flora by the Cranberry, *O. palustris*, a pretty little evergreen with prostrate, thin, wiry branches, and small leaves; the red flowers are followed by dark red globose fruits. The Large, or American Cranberry, *O. macrocarpus*, is a more vigorous species with larger leaves and fruits. In some districts in the United States this plant is very extensively cultivated for its fruits, and there is no reason whatever why it should not succeed equally well in Britain if properly cared for. Sir Joseph Banks in the "Transactions of the Horticultural Society," at the commencement of the present century, gives a detailed statement of the way in which he grew the plant at Spring Grove. In the centre of a pond, a kind of artificial island was made; it consisted of an oak box twenty-two feet in diameter, and thirteen inches deep—the bottom, bored through with many holes, being five inches below the surface of the water. First a layer of stones and rubbish was placed in this box, and then it was filled up with bog earth. A number of curious bog plants were grown here, but the American Cranberry grew so luxuriantly as soon to occupy the entire space. We read that in 1806 twenty-three bottles of very fine Cranberries were produced, much superior in flavour to those imported. Then the cultivation was still further extended by making a bed on the side of the pond, by means of a few stakes driven into the bottom parallel to the side, and lined with old boards. That, however, such conditions are not absolutely necessary to the successful management of the American Cranberry, is proved by other contributors to the same publication some years later; one of these made a large bed away from water, and in a rather dry situation; bog earth was used in making this bed, and rooted cuttings of the Cranberry planted out. This was in 1818, "and in the autumn of 1820 the entire bed was filled so completely by the plants, as to form a mass through which a weed could scarcely penetrate, the whole exhibiting a profusion of bearing branches, which are now (May, 1821) putting forth such an abundance of blossoms as not only to make a very handsome appearance, but to promise a supply of berries far exceeding my expectations." Dry, healthy commons and wastes would produce a large supply of these fruits, with little labour or expense, either for the markets, or for food for moor game. Peat is the only soil in which the Cranberry will thrive, and it should have an open sunny spot.

Oxydendron arboreum, formerly known as *Andromeda arborea*, is the only species of this genus of Heathworts. The deciduous leaves in shape and size are somewhat like those of the Peach. The white flowers terminate the branches of the season, and are borne in long, one-sided racemes clustered into an open panicle. The distribution in a wild state is from Pennsylvania and Ohio southward, mostly along the Alleghanies; and the positions it generally affects are rich woods. Like most of its

relations, this fine ornamental tree requires peat; it attains a height of from fifteen to forty feet.

Pæonia.—The only shrubby Pæony in cultivation is *P. Moutan*, a native of China, which was introduced to Britain towards the close of last century. It is a splendid shrub, with double and single white, pink, crimson, purple, and striped flowers. In many places the leaves and young flower-buds are apt to be injured by spring frosts in our changeable climate, and, therefore, a certain amount of protection during the earlier period of growth is desirable—the ripened shoots withstand perfectly the cold of winter. There are fine specimens in some of the Northern English counties, which, however, are never sheltered, and yet do not suffer, or very rarely, from spring frosts; but as much cannot be said for many in some of the Southern counties. Several of the fine varieties introduced from China and Japan by Fortune are probably lost, but numbers have been raised by cross-fertilisation, &c., and some of these are amongst the most gorgeous of all shrubs. The tree Pæonies can be readily propagated by grafting on tubers of the stronger-growing herbaceous species, or they can be increased by layering.

Paliurus.—There are only a couple of species in this genus, which is nearly allied to *Rhamnus* and *Ceanothus*. One of these is *P. aculeatus*, a branching spiny deciduous shrub, with light green three-nerved leaves, and small greenish-yellow flowers, sometimes developed in such profusion as to give a yellowish colour to the entire shrub. It is a native of South Europe and Western Asia, and is sometimes cultivated under the name of Christ's Thorn. In the South of England, at any rate, it is hardy.

Parrotia.—Both the species of this genus of *Hamamelideæ*—there are only two—are in cultivation; but one, a native of Cashmere, is as yet exceedingly rare in this country; the other, *P. Persica*, from the Caucasus and Northern Persia, is a slow-growing and small deciduous tree, with oblong or orbicular leaves, having crenated margins. The flowers, which appear before the leaves, are inconspicuous; but the gorgeous tints asssumed by the decaying leaves in autumn render this tree at that period of the year one of the most beautiful of objects. Bronze, yellow, and orange-scarlet are the prevailing tints, and these are more intense if the plant be grown against a wall. It is, however, perfectly hardy, and is readily propagated by layering.

Paulownia imperialis, the only member of this genus of *Scrophularineæ*, is a deciduous tree, with very large ovate heart-shaped leaves, clothed with a greyish tomentum. The large fragrant purple-violet spotted flowers are borne in terminal panicles, and in France and elsewhere on the Continent, where the tree is extensively planted, produce a fine effect in May. Unfortunately, however, the buds being formed the autumn preceding the spring when they should expand, the uncertain climate of Britain and the late spring frosts rarely permit them to come to perfection. This species, which is a native of Japan, seems to have become pretty generally known by the name of Vanilla-tree, and every year travelling Britons are writing to the English journals for information respecting it.

Pavia.—The Pavias are now generally included under *Æsculus*, from which genus, indeed, they only differ in having a smooth, not prickly, fruit. They are low-growing, very ornamental, deciduous trees or shrubs, readily propagated by budding or grafting on the common Horse Chestnut. *P. discolor* has the flowers variegated with white, yellow, and purple. *P. humilis* has brownish-scarlet flowers. *P. macrostachya* is a shrub with stoloniferous roots, and long terminal racemose panicles of white flowers, with long exserted stamens. This last is increased by seeds, which should be sown as soon as they are ripe, or by dividing the roots; it thrives best in a damp clayey spot, and should be allowed to make a large mass, as when in flower it is very beautiful, and totally unlike any other hardy flowering shrub. All the three species previously named are natives of North America.

Periploca Græca is the only member of the genus *Periploca* worthy of mention here. It is a hardy deciduous twiner, with ovate or lanceolate dark green leaves, and curious velvety flowers, greenish outside and brownish within. It is a rapid grower, and well adapted for clothing a wall, or covering arbours, &c. A native of the Mediterranean region.

Pernettya.—*P. mucronata* is a wonderfully pretty, dwarf, compact-growing evergreen, with small leathery leaves and white flowers, which are succeeded by red fruits. It is a native of the extreme south of South America, and, as might be expected, is perfectly hardy in this country. A peat border is the place in which it is most thoroughly at home. Mr. L. T. Davis, of Hillsborough, in County Down, who has paid particular attention to this charming shrub, has succeeded in raising a large number of valuable varieties, differing markedly in the size and colour of the fruits; some of these vary from white to lilac, bright rose, purple, crimson, and almost black. Either for cultivation in pots, or for

the outdoor winter decoration of the flower garden, there are no more beautiful objects than Mr. Davis's varieties of *P. mucronata*.

Persica.—Botanically the species of *Persica* form nothing but a section, and by no means a distinct one, of *Prunus;* but for horticultural purposes it is, perhaps, as well to treat it as if it were really entitled to generic rank. With the garden varieties of Peach and Nectarine we have nothing to do here; only the purely ornamental ones are mentioned. The common Peach, *P. vulgaris*, is a native of Persia, &c., according to most English books; but De Candolle's researches seem to point to China as its original home. It is probably only in the South of England that the Peach and its varieties, like the Almond, are hardy enough to thrive and flower freely in the open shrubbery, &c., without protection. The purple-leaved form, *P. v. atropurpurea*, is a distinct foliage plant, well worth growing. The various double-flowered ones, introduced from China and Japan by Fortune and other botanical travellers, are very handsome free-flowering trees. Their names are sufficiently characteristic—*flore-pleno roseo, flore-pleno albo, semi-pleno albo, flore-pleno rubro, camelliæflora, dianthiflora, versicolor*. All these are readily propagated by budding on the Plum stock.

Phellodendron.—There are only two species of this genus of the Rue family, both of them natives of Amurland. The one in cultivation, *P. Amurense*, is a somewhat recently introduced, small, hardy deciduous tree, with opposite or alternate unequally pinnate leaves, and inconspicuous diæcious flowers. It is a pretty little tree, with rough bark, which becomes decidedly corky in older specimens.

Philadelphus.—This genus of *Saxifragaceæ* is nearly allied to *Deutzia*, from which it principally differs in having larger, often very fragrant flowers, with four petals: the terminal flower in each inflorescence has, however, five petals. Under the name of Syringa, or Mock Orange, *P. coronarius*, the European species, is largely grown. It has tufts of creamy-white, powerfully fragrant flowers. There are many varieties of this species, including various double ones and others with silver and gold variegated foliage. *P. Gordonianus*, *P. grandiflorus*, and *P. inodorus* are North American species, the latter, as implied by the specific name, having scentless flowers. *P. Satsumi* and *P. Yokohama* are pretty dwarf species from Japan. All the *Philadelphus* above-mentioned are of the easiest cultivation. They seem indifferent to soil, and are easily and quickly propagated by cuttings of the young wood.

Phillyrea.—All the members of this genus of *Oleaceæ* are natives of South Europe, &c., with the exception of *P. Vilmoriniana*, which is a recent introduction from the mountains of Lazistan. *P. angustifolia*, *P. media*, and *P. latifolia* are compact-growing evergreens, varying a good deal in size and outline of leaf, and are, perhaps, mere forms of one variable species. In the South of England, &c., they are especially valuable for sea-side planting. *P. Vilmoriniana* is much hardier than the others. It has large rigid pointed leaves, and white flowers, larger in size than those of the other species, produced in clusters from the axils of the leaves. All strike readily from cuttings, or they may be grafted on the common Privet, or, better still, on the Oval-leaved Privet, *Ligustrum ovalifolium*.

Phlomis is a small genus from the Mediterranean region and temperate Asia. *P. fruticosa*, the Jerusalem Sage, is a dwarf shrub, with lanceolate-ovate or oblong-crenate leaves, clothed with a yellowish tomentum. The large, handsome yellow flowers are produced in whorls in the axils of the upper leaves. This beautiful summer-flowering shrub is a native of Southern Europe.

Pieris.—The members of this genus were formerly included under *Andromeda*, and even now are frequently mentioned under that name in gardening periodicals. *P. floribunda*, from the Southern United States, is a handsome evergreen, with narrow-oblong dark green leaves, and white flowers, in crowded panicles of dense naked racemes. *P. Japonica*, from Japan, is even more ornamental than the last-named species. It is a lovely plant, with pendent inflorescences of white waxy bells; there is a form in cultivation with the leaves margined with white. All the *Pieris* require a peaty soil.

Platanus.—The common Plane, *P. acerifolia*, very frequently cultivated under the name of *P. occidentalis*—which is a distinct species from North America—is one of the most useful of all ornamental deciduous trees. It is unrivalled as a shade or avenue tree in towns, and is so well known as not to need any minute description. As a rule the leaves are three-lobed, or, if five-lobed, less deeply so than in *P. orientalis*, which is a more spreading tree, with rougher, more gnarled stems. *P. cuneata* has the leaves more or less wedge-shaped at the base. All these are natives of the Orient. There is a variegated form of the first-named, and a number of slightly varying forms have received distinctive names in nurseries.

Populus (*Poplar*) is nearly allied to *Salix;* indeed these genera are the only ones of the Willow order,

Salicineæ. There are only about eighteen distinct species of Poplar, and all of them are confined to north temperate regions. The following are the most valuable, both from a purely economic point of view and that of ornament also:—*P. alba*, the White Poplar, or Abele, is a forest tree of the first magnitude. Its leaves are clothed with a cottony down beneath, and present a remarkable appearance when moved by the wind. It is widely distributed throughout Europe, North Africa, and Asia. *P. a. nivea* is a form with leaves more distinctly white than the type, and *P. a. canescens*, the Grey Poplar, is another, with leaves ashy-grey beneath. *P. a. Bolleana* is a recently introduced Asiatic form, of a pyramidal or fastigiate habit—indeed, the counterpart, in this species, of the Lombardy Poplar. *P. angulata*, the Angled Cotton Wood of North America, has the twigs acutely angled or winged, and broadly deltoid or heart-shaped large leaves, with obtusely toothed cartilaginous margins; it is a fast-growing tree, attaining a large size. *P. balsamifera*, the Balsam Poplar, or Tacamahac, from the same country as the last-named species, has round branches, with ovate, gradually tapering and pointed, serrated leaves, smooth on both sides; the large buds are covered with a copious, fragrant, resinous matter, hence the specific name. *P. b. candicans* principally differs from the typical *P. balsamifera* in having the leaves whitish beneath. *P. grandidentata* is another North American species; it is a medium-sized tree, with ovate-orbicular, coarsely-toothed leaves; a weeping variety is, perhaps, more frequently grown than the type. *P. heterophylla*, the Downy Poplar of the Eastern United States, has round branches, long-stalked, heart-shaped, or roundish-ovate leaves, which are white-woolly when young, but nearly smooth when mature; it attains a height of from forty to sixty feet; there is a form with variegated leaves in cultivation. *P. nigra*, the Black Poplar, is the one which is perhaps most extensively planted in this country; it is a very fast-growing tree, with glabrous shoots, glutinous buds, and triangular-ovate, acuminate, serrated leaves. *P. n. dilatata*, the Lombardy Poplar, differs from the type principally in its erect fastigiate habit. *P. Eugenei* is a valuable variety, intermediate in habit between the typical Black Italian and the Lombardy Poplars; it originated as a seedling in the famous nurseries of Messrs. Simon-Louis frères, at Metz. *P. tremula*, the Aspen, is a well-known indigenous tree, rarely attaining a height of eighty feet, and is remarkable for the almost constant quivering motion of its leaves; a weeping variety of this is a useful and very ornamental tree. *P. tremuloides*, the American Aspen, is a nearly-allied species, also represented in gardens by a desirable weeping form.

Prunus.—As it would be impossible to compress within the space available an account of the different wild Plums from which our numerous garden varieties have sprung, or, rather, are supposed to have originated, only a few of the most distinct species in this important genus are included. *P. divaricata* is a slender-twigged species from the Caucasus, one of the earliest to flower; a good specimen on a lawn seems in early spring to be clothed with a mantle of snow, so profusely are the flowers produced; notwithstanding it rarely fruits in this country. *P. Myrobalana*, an allied species from the same botanical region, flowers somewhat later than *P. divaricata*, but still earlier than most other Plums; the fruits, which are not often developed in Britain, are a fine red colour, and about the size of a Cherry. It makes a thoroughly good and ornamental hedge plant, and thrives well in poor sandy or gravelly soils. *P. Pissardi*, a beautiful variety of this, with rich-coloured reddish-purple leaves, is a recent introduction from Persia. *P. Americana*, the wild Yellow or Red Plum of the Eastern United States, has a roundish-oval fruit, varying from orange and yellow to red. It is a thorny tree, from eight to twenty feet high, perfectly hardy, and ornamental both in flower and fruit. *P. triloba*, or, as it is sometimes called, *Amygdalopsis triloba*, is a native of China and Japan, and one of the most profuse, as well as one of the most handsome, of early-flowering shrubs. It has large, rose-coloured, double flowers, which come to greater perfection if the plant be grown against a wall. *P. Sinensis flore-pleno* is a dwarf compact grower, best adapted of all those mentioned for growing in pots. A very desirable shrub, too, is the double form of the Sloe, *P. spinosa*, a dense-growing spiny bush, laden in spring with double snow-white flowers.

Ptelea trifoliata is the only species of this genus of the Rue family worthy of mention here, perhaps indeed the only one in cultivation; it has long-stalked, trifoliolate, glabrous, light green leaves, which, as well as the fruits, emit a powerful odour of Hops when bruised. A form with bright golden-yellow foliage is one of the best of pictorial shrubs. Both are quite hardy, and thrive in almost any soil or situation.

Pterocarya Caucasica is a handsome deciduous tree, allied to the Walnuts, with large unequally pinnate leaves. Planted near water, where its roots can obtain an abundant supply of moisture, this makes fine bold leaves, about a couple of feet in length. It is certainly worthy of more extended cultivation.

Pyrus.—There exist about forty distinct species in this genus, accepting the standard of specific rank

as adopted in the "Students' Flora of the British Islands." Of these the most distinct are included in these notes. *P. Aria*, the White Beam, an indigenous tree, of which there are many varieties, differing in the form of the leaf, and the degree of whiteness of the under surfaces, is conspicuous in a shrubbery or as a single specimen, and attractive either on account of its leaves, flowers, or fruits; the latter are spherical, and red or scarlet in colour. *P. Aucuparia*, the Mountain Ash or Rowan-tree, has creamy-white flowers, and small globose, scarlet fruits, borne in large clusters; unlike any of the other species here mentioned, with the exception of *P. domestica*, this has pinnate leaves. *P. baccata* principally differs from the Siberian Crab, *P. prunifolia*, in the calyx lobes falling early, whilst in its near ally they are persistent. Many forms of each are in cultivation, and are most ornamental, either in flower or when laden with their small brightly-coloured fruits. *P. coronaria*, the American Crab, has the leaves frequently more or less lobed, and large rose-coloured, scented flowers, and green fragrant fruits. *P. domestica*, the true Service Tree, is somewhat like the Mountain Ash, but it has much larger fruits; there are two forms, only differing in the fruits, one being Pear-shaped, the other like an Apple. *P. elæagnifolia*, an Asiatic species, has small Pear-shaped, hard woody fruits, and silvery-white narrow leaves; this is a singular and very desirable ornamental shrub. *P. floribunda*, a Japanese Crab, has flowers bright red when in bud, and rosy-tinted when fully expanded; it is a compact dwarf-growing species, one of the most desirable of all the Crabs; it may be taken up and grown in pots for forcing. *P. Japonica* is one of the finest of early-flowering shrubs, and deservedly a favourite for clothing walls, &c. There are numerous varieties, ranging in colour from deep scarlet to pure white, and double forms also occur. *P. Maulei*, a near ally of *P. Japonica*, is another Japanese shrub, but a dwarf grower, with orange-scarlet flowers; its fragrant yellow fruits are freely produced, and make an excellent marmalade.

Quercus (*Oak*).—Whether regarded from the purely economic standpoint—as trees yielding in various parts of the world a vast quantity of valuable timber—or simply as ornamental objects affording first-class material for the embellishment of the landscape, the genus *Quercus* holds a very high place in the estimation of both forester and landscape gardener. There are upwards of 300 species, most of them natives of the temperate regions of the Northern Hemisphere. Within the tropics they are confined to the mountains; in the New World they extend to Columbia, and in Asia to the Malayan Archipelago. They are absent from Africa—except the Mediterranean region—South America, the Mascarene Islands, Australasia, and the islands of the South Pacific. The following are amongst the most desirable of the large number of species cultivated in this country; for convenience of reference they are arranged in two series—viz., those with evergreen or nearly evergreen leaves, and those which are deciduous.

Evergreen Oaks.

Q. acuta, perhaps more widely known under its garden name, *Q. Buergeri*, is a Japanese species, with large, leathery, entire, acuminate, dark green leaves; of this there are several forms varying slightly in size and outline of leaf, and also in habit. As it is a recent introduction, one cannot say with certainty what size it is likely to attain in Britain; it is, however, a distinct and hardy plant, well worthy of a place in any garden.

Q. Ballota is a near ally of the well-known Holm, or Evergreen Oak, *Q. Ilex*. It is a small tree with corky bark, and round, toothed, rigid leaves, dark green above and whitish beneath. A native of South-western Europe.

Q. glabra, from Japan, is a dwarf-growing species, with leaves about the size and shape of those of the common Cherry Laurel. The acorns are sessile, in long, erect spikes, and they have ripened in this country. In the South of England, at any rate, this has proved hardy, having passed scatheless through at least twenty winters without protection of any kind. The writer has no knowledge of the behaviour of the plant in the Northern counties, probably because it is by no means frequently met with, although thoroughly deserving of more extended cultivation.

Q. glandulifera is the correct name of an Oak which has been largely planted during the last five-and-twenty years under the name of *Q. Austriaca sempervirens*. It is a rapid grower, with dark green leaves, which are not shed until the new ones are ready to take the place of those of the previous year. It is thoroughly hardy, and one of the most ornamental and useful of the section. A native of Japan.

Q. Ilex is the Evergreen Oak, which is more extensively planted than any other. There are magnificent old trees in the arboretum at Kew, and also at Syon, and elsewhere in the South of England. The species is a very variable one, scarcely two seedlings in a batch being quite alike; the leaves range from narrow-lanceolate to oblong, or nearly rotundate. It is a useful sea-side plant. The variety called *Fordii* has narrow leaves, and the lateral branches have an upward tendency like those of the Lombardy Poplar. A native of the Mediterranean region.

Q. Lucombeana is a garden variety of *Q. Cerris*,

with sub-evergreen foliage. It makes a large tree, and is a rapid grower. It was raised by Lucombe, a nurseryman at Exeter, about 1762.

Deciduous Species from Canada and the Eastern United States.

Q. alba, the White Oak, has lyrate or sinuate-pinnatifid leaves, bright green above (smooth when mature) and glaucous beneath. It makes a large tree, and is a rapid grower, perfectly hardy in Britain. In its native habitats the timber is largely used for ship-building, and in constructions of all kinds. The acorns, about an inch long, have edible kernels, and are seated in short, rough, saucer-shaped cups; they are perfected in the autumn of the first year.

Q. bicolor, the Swamp White Oak, has leaves coarsely sinuate-toothed, but only slightly lobed, the under surfaces being white-hoary, with soft down. This species has a wide range; it occurs from Canada to Georgia, and is generally found in deep alluvial soils along streams, &c., in bottom lands. Sometimes, though rarely, it exceeds thirty feet in circumference; the timber is said to be equal to that of the common White Oak.

Q. coccinea, the Scarlet Oak, unlike the two previous species, is a biennial-fruited one; that is to say, the acorns are perfected in the autumn of the second year, and are therefore on old wood below the leaves of the season. The large, deeply pinnatifid leaves are bright green, and shining above, the lobes being divergent and sparingly cut-toothed. The Scarlet Oak is a rapid grower, succeeding well in either dry or moist soils; the wood is reddish, and coarse-grained, and probably of little value in comparison with that of many other species. The rapid symmetrical growth, and the large leaves, which change to a bright scarlet in autumn, render this Oak one of the most effective for the park or pleasure ground.

Q. macrocarpa, the Bur Oak, Over-cup, or Mossy-cup Oak, is a handsome tree, nearly allied to *Q. alba*. It sometimes attains a height of sixty or eighty feet. The last two of the three English names above-quoted have originated on account of the acorn being half-covered, or entirely enclosed within the cup, the upper scales of which are awned so as to make a mossy-fringed border.

Q. nigra, the Black-Jack or Barren Oak, grows well in gravelly barren soil. It has large leaves, broadly wedge-shaped at the base, and widely dilated, somewhat three-lobed above. It rarely exceeds twenty-five feet in height, but being very distinct in aspect, is a desirable ornamental plant. Some of the forms are dwarf, not more than six feet in height. The leaves turn a coffee-colour before falling. Like the Scarlet Oak, this is one of the biennial-fruited set.

Q. Phellos, the Willow Oak, is remarkable for its linear-lanceolate, glabrous, light green, Willow-like leaves. It is a pretty, fast-growing tree. The acorns have never been produced at Kew, although there are old and very fine specimens; they are biennial.

Q. rubra, the Red Oak, is a near ally of the Scarlet Oak, and like it, makes a large tree, with the foliage brightly coloured in autumn.

Deciduous Species from Europe and Asia.

Q. castaneæfolia, a native of the Caucasus, is a handsome strong-growing species, with rather large leaves, much resembling in outline and nervation those of the Spanish Chestnut.

Q. Cerris, the Turkey Oak, is a much more rapid and symmetrical grower than the common Oak; it is found throughout South Europe, and a large number of slightly varying forms have received distinctive names. The common form has deeply and unequally pinnatifid, dark green leaves. There is a fine variety with silver variegated foliage, and others with sub-evergreen leaves; in all, the bracts which form the acorn-cup are long, narrow, and spreading, thus earning for the section their distinctive name—Mossy-cup.

Q. conferta, or *Q. Pannonica*, as it is not unfrequently called, is one of the noblest of the European Oaks; it is of fine, symmetrical, pyramidal habit, and has large, deeply pinnatifid sinuate leaves. A native of Transylvania, &c.

Q. dentata, a native of China and Japan, is a fine species, with very large leaves, having sinuated margins. It is sometimes found in nurseries under the name of *Q. Daimyo*. Additional interest attaches to this from its being one of the food-plants of the Chinese silkworm.

Q. Mirbeckii, a South-west European Oak, also found in Northern Africa, is a handsome plant, retaining its bold dark green leaves long after those of most of the other deciduous species have fallen.

Q. pedunculata.—This, and the next, constitute what is collectively known as *Q. Robur*, which, however, splits up into two distinct sections—the one just mentioned, with stalkless leaves and stalked acorns; and *Q. sessiliflora*, with stalked leaves and stalkless acorns. A host of forms of each occur in nurseries, &c., and a few of the more remarkable are given here. *Concordia* is a variety with bright golden-yellow foliage, and is a fairly rapid grower; under favourable conditions it is one of the best of all golden-leaved trees. *Fastigiata*, the Cypress, or Pyramidal Oak, has the habit of the Cypress, or Lombardy Poplar, but otherwise does not differ

from the ordinary *Q. pedunculata*. *Heterophylla* is a form with light green, variously slashed and divided leaves; it is a distinct and ornamental plant. *Filicifolia* has the leaves deeply pinnatifid. *Purpurascens* has foliage in outline like that of the green-leaved type, but the young leaves, the leaf-stalks, and young shoots are almost entirely purple during the earlier part of the season of growth; later on the colour changes to a dull bronze. *Variegata* only differs in having the leaves splashed with white.

Q. sessiliflora, in addition to the stalkless acorns, and the stalked leaves, differs from *Q. pedunculata* in leaf-outline, colour, &c., so much so that it is not difficult to recognise from some distance the two when growing intermixed. The sub-species now in question does not seem so prone to foliage variation as *Q. pedunculata;* there are not nearly so many garden varieties. Those mentioned below are the best. *Cochleata* has somewhat shell-shaped leaves; that is, instead of being flat, they turn upwards, so as to render the upper surface more or less concave; it is a free-growing and pretty form. *Louetti* has long, almost entire, Willow-like leaves, narrowed to both ends, measuring, with the stalk, about six inches in length, by about an inch in breadth. *Rubicunda* has rather deep red leaves, and in the early summer is very conspicuous. All the forms, both of *Q. sessiliflora* and *Q. pedunculata*, must be increased by grafting on clean-grown, vigorous, seedling Oaks.

Raphiolepis.—This is a genus—nearly allied to *Cotoneaster*—of about half a dozen species of pretty evergreen shrubs; the cultivated ones being all natives of China and Japan. The best-known and, perhaps, most desirable species is *R. Japonica*, which has glossy, dark green, leathery, oval or obovate leaves, and fragrant white flowers arranged in large, terminal, thyrsoid panicles; it thrives well under varied conditions as regards soil and situation, and is readily propagated from cuttings or seeds.

Rhamnus.—This genus, which gives its name to the natural order *Rhamneæ*, contains about sixty species, natives of temperate and tropical regions; it is represented in Britain by *R. catharticus* and *R. frangula*, the latter being the Dogwood of the gunpowder manufacturers. *R. alaternus*, from South Europe, is the most ornamental of the cultivated species; it is an evergreen, with glossy serrated leaves, varying much in outline. The small apetalous flowers are produced in profusion in May, and are very grateful to bees. Evelyn observes with regard to the Alaternus: "I have had the honour to be the first who brought it into use and reputation in this kingdom, for the most beautiful and useful of hedges and verdure in the world (the swiftness of the growth considered), and propagated it from Cornwall even unto Cumberland." During severe winters it is liable to be injured by frost, but it is rarely killed outright, and soon pushes up again from the roots. There are gold and silver varieties of this beautiful shrub, neither of which is so vigorous as the green-leaved type. All are readily increased by cuttings inserted in sandy soil under a hand-light in August or September.

Rhododendron.—There are about a hundred and thirty species in this splendid genus of Heathworts, but comparatively few of this number are thoroughly hardy in Britain. The head-quarters of the genus is the Himalayan region, but many species are found in the mountains of the Malayan Archipelago, and other parts of Asia, half a dozen in the mountains of Europe, and a few in North America. In favoured spots, such as the South-western and Welsh counties near the sea, several of the magnificent Himalayan species thrive admirably, but in these notes only those which succeed generally are mentioned. Nearly all the Rhododendrons require a peaty soil, but some few affect a limestone formation, in which the great bulk would refuse altogether to grow. In these notes only true species are mentioned; for the innumerable beautiful hybrid and seedling forms, which have principally originated from *R. Ponticum*, *R. Catawbiense*, and *R. Caucasicum*, the reader is referred to the catalogues of those nurserymen who make a speciality of garden Rhododendrons.

R. Catawbiense, a native of North Carolina, is a bushy shrub with broadly oval, flat leaves, bright green beneath; the large bell-shaped flowers open in summer when danger from frost is past, and are lilac, purple, pink, or deep rose in colour.

R. Caucasicum, introduced at the beginning of the present century from the Caucasus—where it is found near the limits of perpetual snow—has whitish or yellowish flowers, opening about August. It is a dwarf, compact grower, and has oval leaves, green above, and clothed with a rusty tomentum beneath.

R. Dahuricum is perhaps the earliest of all the Rhododendrons, as it frequently flowers from December to March; it has small, oblong, deciduous leaves, and purple flowers. This Siberian species is the parent of several highly desirable varieties which force admirably.

R. ferrugineum and *R. hirsutum* are generally known under the name of Rose des Alpes. The former is the taller and more robust of the two (rarely exceeding, however, a couple of feet in height), and is readily distinguished by the rusty

colour of the tomentum on the under surface of the leaves; in its native habitats, too, it affects damp spots, where limestone is absent, and slaty rocks, whereas *R. hirsutum* is generally found on limestone, and has ciliated leaves. Both have terminal clusters of rosy-red flowers, and are amongst the most beautiful of European shrubs.

R. Lapponicum, the only European species which is found within the Arctic circle, is a procumbent shrub, with deep green Myrtle-like leaves, and small crimson flowers opening in May.

R. maximum, the Great Laurel of the United States, has elliptical-oblong, very thick, smooth leaves, from four to ten inches in length, and pale rose-coloured or nearly white corollas, greenish in the throat on the upper side, and spotted with yellow or reddish. This species sometimes attains a height of twenty feet.

R. Ponticum is peculiar in its distribution, one form being found in Portugal, &c., and the other in Asia Minor—no intermediate stations being known. This is the hardiest and, perhaps, the least exacting of all the Rhododendrons, and has produced a host of garden varieties. The wild type has pale purplish-violet spotted flowers.

R. rhombicum is a Japanese species with stalked rhomboidal leaves, and flattish purple flowers, opening in spring; it is a deciduous species of dwarf habit—perhaps not exceeding two or three feet in height.

Rhodora.—This genus has been included by the authors of the "Genera Plantarum" under Rhododendron, but for gardening purposes it is better kept distinct. *R. Canadensis* is a handsome deciduous low shrub, with an irregular two-lipped corolla, and oblong leaves, whitish and downy beneath; the shortly-stalked, umbel-like clusters of showy rose-purple (rarely white) flowers appear in the spring, rather earlier than the leaves. A native of mountains and damp cold woods and swamps of North America.

Rhodotypos kerrioides, the only species of the genus, is a pretty Rosaceous Japanese deciduous shrub, with ovate-acute, deeply serrated leaves, silky beneath, and terminal, solitary, small, Rose-like, white flowers. It grows in any kind of soil, and is readily increased by seeds, which ripen in most parts of this country.

Rhus.—The Cashew family, or *Anacardiaceæ*, does not furnish many genera for the outdoor decoration of British gardens. *Rhus* is the most important; it contains about 120 species, the most of which are from warm regions—being most abundant in Southern Africa. Those here mentioned, however, are hardy and very useful deciduous shrubs.

R. Cotinus, the Venetian Sumach, has long-stalked, glaucous, roundish, simple leaves, and a feathery inflorescence, few flowers in which are developed, the rest being metamorphosed into whitish, feathery awns. When in blossom this is decidedly ornamental, and quite distinct in aspect from any other hardy shrub; the bright red tints, too, assumed by the decaying leaves in autumn, render this species a desirable one for the shrubbery. A native of Southern Europe, rarely growing much more than about six feet in height.

R. glabra, the Smooth Sumach of the Eastern United States, has unequally pinnate, glabrous, somewhat glaucous leaves, whitish beneath; the lanceolate-oblong, pointed, serrated leaflets are from eleven to thirteen in number. The small greenish-white or yellowish flowers, produced in a terminal thyrsoid panicle, are followed by small fruits clothed with crimson hairs. A variety (*laciniata*) with the leaflets irregularly cut is very ornamental.

R. Toxicodendron, the Poison Ivy, or Poison Oak, from the same region as the last-named species, has trifoliolate leaves and white berries; it is useful for clothing rocks or old trees, which it climbs by means of rootlets, or for planting among shrubs and trees in the wild garden, and allowing to grow at will. The foliage turns a fine bright yellow before falling in autumn. The leaflets are generally notched, serrated, or lobed; when they are entire, it is the condition known as *R. radicans*.

R. typhina, the Staghorn Sumach, is a near ally of *R. glabra*, but differs in its more numerous hairy leaflets, and densely hairy young branches. It forms a very picturesque small tree, and thrives admirably near the sea; even in the small plots of ground, dignified by the name of gardens, in some of the London thoroughfares, we have seen it bravely growing, and giving an element of beauty to neighbourhoods the reverse of cheering in aspect. Root-cuttings afford a rapid means of increasing this species when seeds are not procurable. *R. viridiflora*, remarkable for the large size of the leaves, and its huge panicles of greenish flowers, is simply a male form of this species.

THE FIG UNDER GLASS.

By William Coleman.

CULTURE IN POTS.

Of all the fruit-bearing trees which come under artificial treatment, the Fig is the most manageable, and it is questionable if the time is not near at hand when it will be the most profitable. Where early forced Figs are grown, it

is hardly necessary to say that a set of pot-trees is not only requisite but indispensable, as they can be so easily forced, rested, and often fruited a second time in houses devoted to other purposes; but the most satisfactory way to grow them is in a light span-roofed pit. This should be efficiently fitted with hot-water pipes for giving top and bottom heat, good plunging-pits with a path along the centre, apex and ground-line ventilators, and a good tank for affording a constant supply of warm soft water. For very early forcing, use moderate growers and free croppers like the good old Brown Turkey, the White Marseilles, Osborne's Prolific, and Negro Largo. For placing along the back of the Fig-house proper, the pyramidal form is to be preferred. For forming the front row or for forcing in compact pits, the bush form will best answer the purpose, as the bulk of the fruit-bearing wood can be kept close to the light.

Having selected suitable plants established in six-inch pots, place them in a pit near the glass, where they can have a night heat of 60° and a rise of 10° to 15° by day. Pinch out the leaders at the height at which it is intended to start the first set of side shoots. When these have made four leaves, pinch the points out of them and tie them out equidistant from each other in a horizontal position. If for pyramids, place a stick to the leader also. Syringe freely and keep the roots well supplied with tepid diluted liquid, to induce a second and a robust break. If the first break produced four shoots, the second will most likely result in double that number, which will be quite sufficient to form the foundation of the pyramid. When the buds have grown an inch, give the plants a shift into clean, well-crocked pots, using good turfy loam of a sandy calcareous nature, to which one-third of old lime rubble or hair-plaster may be added. Avoid animal manure, as this compost will form the nucleus of a ball which will have to keep sound and sweet for a number of years, and manure of this kind would have an injurious effect. A few handfuls of bone-dust may however be added, and clear diluted liquid will stimulate growth when the pots are again full of roots, but not before. Allow the pots to stand on the bed of fermenting material, turn them round occasionally, and syringe well under the foliage to keep it free from spider. When the leader has grown nine inches, it must be pinched to produce more side shoots, which, as well as the breaks from the first set, will also require stopping when they have made four leaves, and so on until the plants again require potting. This, the final shift for the season, may be made into 12-inch pots for the strongest, and 11-inch for the weakest, using the same compost as before. The foundation of the trees having been formed by pinching every shoot at the fourth leaf up to the middle of July, stopping must be discontinued to give the last breaks time to ripen with a good terminal bud. From this time discontinue stimulants and give more air, but still continue a good Vinery temperature, *i.e.*, 65° at night to 80° by day, and well syringe the under sides of the leaves to keep down spider. If all has gone well, close compact trees, three feet in height, will be thickly set with embryo Figs on short stubby pieces of wood, and as these must not be encouraged to swell larger than small Peas, the ripening of the wood must be secured by increasing the air and reducing moisture.

Bush trees like Fig. 5 can be more easily formed by the same mode of treatment, as they do not require staking: an occasional pressure with the hands to give the young growths a pendent habit being generally found sufficient; but where time admits, more shapely trees can be formed by drawing the shoots down to a horizontal position with threads of matting secured to a wire placed round and beneath the rims of the pots. When the wood is quite ripe and the leaves have fallen, remove them to a cool, dry house, where the pots can be packed up in spent tan or leaves to prevent the roots from becoming too dry, and there leave them until again wanted.

When pot-trees are properly formed and established, their after-management is very simple, as they require very little pruning, nearly every growth they make being short and stubby and studded with fruit. In course of time these spur-like pieces of wood may become too thickly placed, light and air being important elements in the ripening of Figs. When this is the case, they should be well thinned out at the winter dressing, and disbudding should be carried on with a free hand when they start into growth. When pruning or thinning out is necessary, short pieces with stout terminal buds should always be preserved, as they are the most fruitful, and increase with the age of well-managed trees. After the trees get into the largest-sized pots and shifting is discontinued, they may be occasionally, but not annually, turned out and partly shaken out, root-pruned, and re-potted in fresh compost.

FORCING THE FIG.

With modern appliances at command, the fruit-forcer of the present day can readily produce ripe Figs from the early part of April nearly up to Christmas. The first are almost invariably obtained from trees established in pots, two and sometimes three crops being obtained from them in one year. The last or third crop is, however, a great mistake, as the fruit so obtained is small, and ripens when

suitable kinds in late houses and cases are producing large luscious Figs of superior quality.

The first set of trees in pots should be started not later than the 1st of December; the first permanently planted house on the 1st of January; the general house a month later, and the Fig-case should be allowed to come on with the season. Light and plenty of heat being essentials, the early house should be cleansed and ready for the pot-plants by the time named. The plants, well washed with soap and water, and top-dressed with fresh loam and manure, should then be placed on inverted pots, or pedestals of dry bricks, to raise the rims of the pots a little above the kerb of the pit, space being allowed for future growth and the full expansion of the foliage. If fire-heat is solely depended upon, the pits need not be more than 18 inches deep, but heat from fire and fermenting material combined being preferable, two feet will not be too much. If Oak-leaves can be obtained, let them be well prepared; fill up the pits when they are in a state of fermentation, leaving one-third of each pot standing above the surface. Insert a thermometer to ascertain that a burning bottom heat does not set in, and draw the leaves away from the pots if it exceeds 80°. Give repeated waterings with tepid water at 90° until the balls are properly moistened through, and syringe the trees twice a day, using the water a few degrees warmer than the mean temperature of the house.

Fig. 5.—Bush Fig-tree in Pot.

Commence forcing with a temperature of 50° to 55° at night, and 5° to 10° more by day, when the weather is mild and favourable to progress; but at this dead season, when daylight is more than counterbalanced by darkness, a lower range may sometimes be found advisable, as nothing can be gained by undue haste at the outset. Keep the glass clean and free from accumulations from condensed steam, by giving a little air at the apex every day, and close the lights when the heat begins to decline from the maximum of 65°. When the points of the shoots begin to swell and show signs of growth, raise the temperature to 60° at night, with a corresponding increase by day, and add fresh fermenting material when the bottom heat falls below 80°. Continue this treatment until the young fruit are the size of Cob-nuts, when excessive watering must be carefully avoided, particularly in dull weather, and let the last syringing be performed not later than one o'clock in the day, as an excess of moisture hanging about the trees after the house is closed may cause the young fruit at this critical stage to turn yellow and drop. When the process of fertilisation is complete and the young growths have made five or six leaves, pinch out the terminal points, and increase the temperature to 68° when the weather is mild. If the fruit has set thickly it may now be thinned, as notwithstanding the fact that young Figs are always liable to drop, it does not improve matters to allow the trees to carry more than they can bring to maturity. Pay particular attention to the bottom heat and see that it does not decline. Renew the top dressing and feed the plants liberally with clear diluted liquid at the temperature of the bed, at every watering. Although the Fig is a gross feeder and thrives well on clear liquid made from animal manures, it is a good plan to change its diet by giving a little weak guano or soot-water at every alternate watering. As days increase in length and the sun gains power, let the temperature rise to 80° for a short time after the house is closed, and syringe the foliage freely to keep it free from spider, but always in time for the fruit to get dry before nightfall.

Ripening the First Crop.—Shortly after the points are pinched out of the young shoots, the fruit which is to form the second crop will begin to advance from the axil of every leaf, and as this will increase the strain upon the plants, the ripening of the first crop must be effected by maintaining a brisk temperature with ventilation by day, as the trees can be allowed comparative rest by night, when a chink of air on the front ventilators will prevent the foliage from becoming soft and flabby. From this time until the fruit begins to take the last swelling

for ripening, endeavour to accommodate the two crops by giving as much water as will prevent the young Figs from suffering, while it is not so abundant as to affect the flavour of the earliest fruit when it begins to ripen, as it is difficult to imagine anything more disagreeable than a vapid, flavourless Fig. But when the earliest Figs almost imperceptibly cease swelling and all at once put on ripening, give more air and plenty of heat, turn the foliage aside so as to expose it fully to the sun, and discontinue syringing.

Gathering the Fruit.—When the Figs begin to crack, and moisture exudes from the eye, and the neck of the fruit becomes soft and flaccid, they are ripe enough to gather for ordinary purposes, particularly if they have to be packed and sent away; but for home consumption by the connoisseur, they should be allowed to hang until their colour (be it light or dark) is perfect, and there is danger of their falling from the trees. Unlike all other fruits that come under the grower's management, this is perhaps the only one that is really improved by hanging until it is more than ripe. When the fruit is very fine and heavy, it may be supported with broad bands of raffia passed under the eye and over the branch. When gathering take flat baskets padded with soft moss or paper shavings, cover with silver paper, and detach each fruit in a soft Vine-leaf placed in the hollow of the left hand. By this means they can be moved without being touched by the fingers, and if it is necessary to keep them, place each fruit on a hair sieve in a dry airy room where it will not mould. In order to prevent the second crop from suffering from drought, give the trees after each gathering as much tepid water as will keep the young growths fresh and crisp, and syringe carefully but well, wherever water can be applied without drenching the advancing fruit. By taking advantage of favourable opportunities the requirements of the two crops may be met without injury to either, and that troublesome enemy, red spider, can be kept in check.

Management of the Second Crop.—When all the ripe Figs are gathered, let the trees have copious syringings with sulphur-water, if necessary, to clear them of insects. Renovate the top dressing on the pots, and turn them round to prevent strong roots from rambling into the plunging material. The latter should also be renovated to keep up the proper degree of heat, which should not fall much below 80°; and feed liberally with soot-water, guano-water, and diluted liquid alternately. Let the air temperature range from 70° at night to 80° by day, with air, and 85° to 90° after closing, with sun-heat. If the second crop is a heavy one, as will be the case on such kinds as Brown Turkey, White Marseilles, and Osborne's Prolific, thin with a liberal hand, otherwise the fruit will be small although excellent in quality. Discontinue pinching, unless it be a shoot that is becoming gross, as every point should have a good terminal bud with several short-petioled leaves clustering behind, and the embryo Figs already forming at the base. These are the fruit that will be the first to ripen in the early spring, at least where two crops in one year are sufficient to satisfy the grower. If covetous, he may force them on to ripen in the autumn; but they will be small and of little value, and the trees will be rendered useless for very early forcing two years in succession.

Autumn Management.—As soon as the second crop is gathered, again ply the syringe most vigorously, and use insecticides if necessary to clear the foliage of insects. Give an abundance of air to ripen up the wood, and turn the plants round to check roots that have found their way into the now decaying plunging material. Give enough water to keep the foliage fresh until it begins to change colour for ripening, then keep the house or pit dry and cool through the night, and on fine evenings throw the roof lights off altogether. Early in September prepare the requisite number of clean pots, large enough to give a three-inch shift, also a batch of compost consisting of sound turf, lime rubble, and bones. Remove the plants to the potting-bench, divest them of crocks and top dressing, cut back all gross roots, and re-pot, using the soil in a dry state. In order to prevent the water from passing away without penetrating the old balls, let the latter be thoroughly watered before they are turned out of the pots, and ram the new with a potting-stick until it is as solid as the old ball itself. Select an open but sheltered situation out of doors facing the sun, for their autumnal quarters; plunge the pots up to their rims; give one good soaking with pure water, and then leave them until there is danger to be apprehended from autumn frosts. In the meantime empty and cleanse the pits, and turn them to account until they are again wanted for their legitimate use.

The Succession House.—When treating of the early permanently-planted Fig-house, it was suggested that the trees should not have too much compost given to them the first year. Such being the case, it is probable that the roots now, say the end of October, have ramified through the first moiety, including the turf wall. Cleanse the trees and the house, tie the main shoots in a horizontal position, and prune back to a single eye every

alternate lateral shoot, as in Fig. 4, for summer growths, which will be pinched at the sixth leaf for the second crop of fruit. Tie the others in to the wire next above the main shoot for the first crop. Fork down a little of the turf wall until the points of the roots are reached, shorten the strongest and add a little fresh compost, again retaining it with a turf wall some eighteen inches in advance of the preceding. Ram it very firm, and after removing all loose particles from the surface of the original border, add a top dressing of fresh loam, free from organic matter. Next prepare the pot trees that are intended to play the part of supernumeraries, by top-dressing with rich compost as previously advised, and place them on sods of turf, grass side downwards, to prevent the roots from penetrating the borders. If they require elevating to the light, use inverted pots with a sod of turf resting on them. When arranging the pot trees, allow plenty of room, not only for their extension, but for the extension of the planted-out trees also, as they will make considerable growth, and it is no use trying to grow good pot Figs in the shade of foliage above them. Keep the house cool and dry, but safe from frost, until, say the 1st of January, which is quite early enough to commence forcing. When the house is closed, fill up the unoccupied part of the future border with fermenting leaves, and apply water to the roots at the temperature of 90°. Syringe regularly twice a day with tepid water, and commence forcing with a temperature of 50° at night and 60° by day, gradually raising it as the trees and the season advance. When the permanent trees get into growth, follow the first season's directions as to stopping and notching the leaders for breaks; pinch the laterals at the sixth leaf to throw up the second crop this year and to secure another break, which will give the first crop in the year following, also rub off all duplicate growths when more than one starts from the single eyes at *a*, Fig. 4. When the terminal points on the first-crop shoots, *b*, have made three leaves, pinch them to throw force into the advancing Figs, and to prevent the foliage from becoming crowded, as these first-crop shoots will be cut back to a single bud at the next autumn pruning, or earlier if the second-crop shoots require their space after the first crop is gathered.

If variety among the pot plants be an object, and late strong-growing kinds from which a second crop cannot be expected are introduced, many of the gross shoots may require cutting back before they are started, all the short stubby growths being left, as they will be the earliest and the most fruitful. These varieties, on account of their vigour, should be placed where they will have the most room, while the kinds specially recommended for forcing in pots will be found suitable for placing along the front where head-room is limited.

The stopping, thinning, and regulating of the young growths early in the season will not differ from that recommended for early pot Figs; but many of them, later on, will require discretionary management, particularly those late kinds which have been pruned to a single bud, otherwise repeated pinching will leave many blind shoots, which will have to be cut back in the autumn. As days increase in length, and solar heat becomes more favourable, the trees will require an abundance of stimulating food and liberal syringing, until the fruit shows signs of changing for ripening. Ventilation, too, will be more liberal, always through the early part of the day, a circulation being maintained on all favourable occasions, and forcing will be carried on as much as possible by early closing with solar heat, when the house may safely run up to 90°. In all other respects, the rules laid down for the management of early pot Figs will apply to this house also.

The preceding cultural directions apply to advancing young trees which have not yet reached their largest pots, or covered the whole of the trellis allotted to those planted out in borders. When they have attained their full size, and have filled the pots and borders with roots, generous feeding and mulching with good rotten dung will greatly assist them during the hot months, especially when they are swelling off second crops of fruit. The borders being well drained and made piecemeal, they become one mass of hungry roots, which cannot easily be over-watered, while the want of water is often as fatal to Figs as it is to Peaches.

The Fig-Case (Fig. 1).—As the treatment of Figs, either in pots or planted out in the span-roofed succession house, is identically the same as that laid down for trees in the lean-to, this part of our subject may be dismissed to leave room for a few words on the management of the wall-case. Many such structures have, of late years, been put up in front of old-established trees on open walls, and the result has been so satisfactory that owners of such trees have found them a profitable investment. Where large old trees of the never-failing Brown Turkey, the Ischias, or the Brunswick, a variety that does not submit to early forcing, are covered in, the first operation will be the correction of the drainage, if it exists, root-pruning, and re-laying in fresh compost. Autumn is the best time to do this, care being observed that the soil is free from manure and not too rich, otherwise the growths will become gross and the fruit will be late in ripening. After the turn of the year, when danger of very severe

frost has passed away, release the trees from the walls, let the latter be re-pointed, lime-washed, and trellised with wires running horizontally and close to every third joint in the brickwork. Then proceed to prune out the least promising superfluous wood, retaining all the short stubby pieces, which are as a rule the best ripened, and if the preceding summer has been fine, fairly furnished with embryo Figs near the points. Anything larger than a Pea may be rubbed off, as they will not grow to maturity. Regulate the principal branches to form the framework of a horizontal or oblique trained tree, cutting back all superfluous shoots to a single eye, for breaks that will give ripe fruit in the following August and September. The pinching of these the first year will depend upon the state of the trees, as there may be a dearth of young wood in some places, while others may be plentifully furnished. Under the first conditions, stopping may not be advisable; under the second, pinch at the sixth leaf to force up the fruit from the axils of the leaves, and to secure a break that will give the first ripe fruit in the succeeding year. Tie all the short stubby terminal pointed pieces in close to the wall, so as to have it evenly covered, but not crowded with foliage, and the trees will be ready for starting. If the case is not heated, ventilate freely to keep the trees from breaking early, but if possible make the structure useful as a storehouse for bedding plants, Strawberries in pots, Chrysanthemums, Salads, and a score of other things, by putting in a flow and return pipe from the nearest boiler. If this is impracticable, an upright slow combustion boiler, requiring no setting, such as described in the article on Heating, will not only answer the purpose, but will in good seasons enable the cultivator to obtain two crops from many varieties in one year. This provision being made, fill the shelf with Strawberries and close for gentle forcing, towards the end of March. Mulch the roots of the trees, and give them plenty of water, but defer syringing until the buds break, and then let it be once during the fore part of the day. The object being the security of a crop that will succeed forcing-houses, protection from frost is all that is actually needed, although there is nothing to prevent the trees from being brought under moderate forcing. As days increase in length and fine summer weather comes on, fires may be dispensed with, and ventilation more freely indulged in, to keep the growths short-jointed and sturdy. But the Fig being a great lover of strong heat, particularly from the sun, early closing will be advisable, and copious syringing, well under the foliage and into the walls to keep down spider, will be necessary. When this stage has been reached, if any of the old shoots have not broken so well as expected, let them be freely notched on the upper sides to induce the incipient buds to move and eventually form shoots. From this time forward the trees may be treated as ordinary wall-trees, or they may be pushed on under the usual Fig-house treatment. When the crop is gathered cleanse the trees, and give gentle fire-heat with air to ripen up the wood, also cover the borders with dry mulching and withhold water from the roots. It may be well to remind the amateur, or young beginner, who may not be well up in the management of the Fig, that the stopping or pinching of the shoots must always be discontinued in time for another break to push and ripen before the leaves fall, otherwise many of them will remain blind and the succeeding early crop will be lost. Early-forced trees may require repeated pinching, but it rarely happens that the occupants of late houses or Fig-cases require stopping more than once.

Everybody's Fig-House.—Hitherto the culture and consumption of choice Figs have been confined to the few, but with cheap glass and timber at command there is nothing to prevent the million from growing and enjoying this wholesome fruit. Houses or glazed sheds of the simplest character can be cheaply erected in warm snug corners or against existing walls, with or without fire-heat, in which all the varieties named will give at least one crop annually, and some of them will continue bearing as long as there is sufficient solar heat to ripen the fruit. Early in October steps should be taken to ripen up the wood, and when the leaves have fallen, all partially swelled fruit may be pulled off, and the trees placed close together at the greatest distance from the glass. No water will be needed through the winter months, provided the pots are well packed with dry fern or straw. Neither will ordinary frost hurt them. Should a frost of unusual severity set in, pot-trees in the unheated house can be entirely covered with dry straw or bracken, but it should be removed in mild weather.

Packing Figs.—The packing of ripe Figs for transit to a distance requires great care, particularly when they are quite ripe. For market purposes they should be gathered as soon as they are well coloured and show a tendency to open at the apex, when they can be packed without injury and will keep for a few days after they are received. If the house is kept thoroughly dry and well ventilated, the fruit can be gathered in much better condition than when it is charged with moisture.

For private purposes they should be gathered and despatched on the day they are required for use.

They are packed as described under Peaches, but

the boxes for Figs need not be quite so deep as those recommended for Peaches, neither should they be so large, at least without having divisions placed across them. A box four inches deep, twenty-four inches long, and divided into three compartments by two transverse divisions, is a good size where large quantities are grown. When large extra-ripe Figs are packed for immediate use, some growers use boxes divided into squares just large enough for a single fruit. In every other respect the *modus operandi* is precisely the same as that already described. The secret of success in packing all kinds of tender fruit consists in keeping it free from bruise or taint, and in using non-odorous elastic materials that will prevent the slightest movement in transit.

Dishing Figs.—A dish of fine Figs is a noble acquisition to the dessert, but being so tender they require very careful handling. When large dishes are used, a foundation can generally be made with a layer of less tender fruit of some other kind, well masked with fresh green Vine-leaves. Upon these, using plenty of leaves with their points slightly protruding, the Figs can be placed with the apex outwards without receiving injury, as the soft Vine-leaves prevent them from adhering to each other, as very ripe Figs are apt to do. A fine opening fruit should always be selected to crown the dish.

The most graceful and pleasing desserts are invariably set up on medium-sized raised dishes, when a moderate number of fine fruits will form a handsome dish.

Packing and Dishing for Exhibition.—When Figs have to be carried hundreds of miles, the materials used for packing should be very dry, absorbent, and pervious to air. Extra-prepared moss, or soft paper shavings, answer better than anything of a heating nature, and flat, shallow wicker baskets are preferable to boxes. Each Fig should be folded in a large Vine-leaf, and bedded in the packing, with a layer of shavings over all to keep them from moving. Figs, like Peaches, should not be crowded together or touch each other on the dish, the latter should therefore be well filled with moss to throw them up, and each fruit should be placed, apex outwards, on a Vine-leaf, a fine one being reserved for the centre. The telling points are size, colour, and uniform ripeness.

Varieties of Figs.—Although the varieties of Figs are now very numerous, it rarely happens, except in the case of pot-culture, that many kinds are found growing in one garden. For all general purposes it is questionable if the old Brown Turkey and White Marseilles have yet been surpassed. Add to these Osborne's Prolific and Negro Largo, and varieties fit to give a choice supply of fruit from April up to December are at command. For the benefit of those who are not well acquainted with Figs the following list will be found reliable.

Select List of Figs.

1. Angélique, or Madeline—medium size; skin yellow; flesh white, tinged with red; prolific and forces well.
2. Bourjasotte, Black—medium size; skin black; flesh red; juice rich and syrupy. Excellent.
3. Bourjasotte, Grizzly—medium size; oblate; skin brown; flesh dark red; rich and delicious. One of the best.
4. Brown Turkey, or Lee's Perpetual—large; pyriform; skin purple; flesh red and highly flavoured. The best Fig for general cultivation in pots, borders, or on open walls.
5. Brunswick—large, pyriform; skin dark; flesh red; well suited for walls or Fig-cases, but does not force well.
6. Castle Kennedy—very large; round and handsome; skin chestnut colour; flesh reddish-brown. A vigorous grower, but shy, adapted for a high wall enclosed with glass.
7. Col di Signora Bianca—medium size; pyriform; skin green; flesh blood-red; rich and good.
8. Col di Signora Nero—large; pyriform; skin dark chocolate, with grey bloom; flesh dark red; rich and sugary; a good late Fig.
9. Datte—medium size, oblate; flesh dark red; rich and syrupy. An excellent Fig for forcing.
10. Dauphine d'Argenteuil, or Grosse Violette—very large; prolific. Said to be of excellent quality.
11. Dr. Hogg—medium size; black; flesh red; juicy and rich. Very handsome when grown under glass.
12. Early Violet—very small; forces well in pots, but too small. Surpassed by others.
13. Fig d'Or—large; bronzy-yellow; prolific and excellent.
14. Grosse Monstreuse de Lipari—large; prolific, and said to be excellent.
15. Grosse Verte—large; greenish-yellow; flesh dark red; vigorous grower. A good variety.
16. Ischia, Black, Nero, or Early Forcing—medium size; skin black; flesh red. A good old Fig.
17. Ischia, Brown—large; globular; flesh red; prolific and excellent.
18. Ischia, Green—small; turbinate; prolific and forces well in pots.
19. Ischia, White, or Singleton Perpetual—small; oblong; skin brown; flesh purple; sweet and rich; prolific. Forces well in or out of pots.
20. Marseilles, Black, or Black Provence—small; oblong; dark brown; flesh rich; forces well and an abundant bearer.
21. Marseilles, White, Raby Castle, or White Genoa—medium size; round; pale green; flesh very rich. Bears abundantly on walls in the open air, and forces well. Does well in pots. Most excellent.
22. Negro Largo—large; oblong; black; flesh pale red; rich, tender, and juicy. Forces well in or out of pots; hardy and prolific. One of the best.
23. Osborne's Prolific—above medium size; pale green; flesh white; quality excellent. One of the best, but being tender, it should be ripened with plenty of air. It is well adapted for forcing in pots and planting out in a hot or cold house.
24. Williams' Prolific—pyriform; flesh sweet and luscious; a good pot Fig, forces well, and suitable for cold house or walls.

With the exception of Nos. 5 and 6, all the preceding varieties are adapted to fruiting in pots, but all are not alike suitable for early forcing. For starting very early and growing in quantity, Nos. 4, 21, 22, and 23 will be found invaluable. If variety be the object, Nos. 14, 19, and 20 may be added.

Insects to which the Fig is subject.—The insects most frequently found in the Fig-house are red spider, thrips, mealy bug, and brown scale. The first does not often cause trouble until the fruit begins to ripen, and as syringing can only be occasionally resorted to, a strong effort should be made to have the trees clean at the time moisture is discontinued. The usual remedies are the timely sponging of the leaves with warm soap-water, syringing with clear sulphur-water after the fruit has been closely picked, and painting the pipes with sulphur when the house is close and dry. Sulphur should always be applied to the pipes after the sun has gone down, and air should be given before it touches the roof the following morning.

Thrips must be treated as described in previous fruit articles. *Mealy Bug*, like thrips, is generally introduced by means of infested plants from other departments, and a most formidable and loathsome enemy it is. Its entire destruction during the growing season is very difficult, but it can be kept in check by the use of methylated spirits applied with a small brush, and the trees can be syringed with paraffin and water, a wineglassful to four gallons of water, after all the fruit is gathered. As the oil does not readily mix with the water, one person should keep them in constant agitation with a syringe, while a second applies the mixture to the trees. If washed within half an hour with clean water the foliage will not be injured.

Brown Scale.—In a dry warm Fig-house this insect makes rapid strides, and soon extends from the wood to the leaves and fruit. If taken in hand as soon as the first family of young make their appearance, the majority may be destroyed by using a hard half-worn painter's brush, or a few stiff bristles tied together and cut flat at the ends. When all the fruit is gathered the trees can be well syringed with hot water at a temperature of 120°.

These remedies during the growing season only scotch the scale and bug, but when the trees are dormant more effectual cleansing should be carefully performed. Every tie should then be removed and burnt, together with all loose mulching and prunings, the walls washed with hot lime and sulphur, the glass washed, and the wood-work painted. Last of all the trees should be well scrubbed with strong soap-water and painted with Gishurst compound, eight ounces to a gallon of soft water. When forcing is commenced it will again be necessary to keep watch for any insects that may have escaped the winter dressing. So soon as one bug or scale appears it must be instantly destroyed or picked off. Before the leaves are fully developed the pests are readily seen. If these precautions are neglected, mealy bug will never be eradicated.

TUBEROUS-ROOTED PLANTS.

By William Hugh Gower.

MANY of the names under the following list are often classed under Bulbous Plants. This, however, is incorrect, according to the definition of a bulb so lucidly set forth in the Life-History of Plants by Dr. Masters in our first volume, and it will be best to arrange them in a division by themselves. A few of similar character have already been treated of under Green-house Plants, being so well known as such that their inclusion could hardly be avoided.

Achimenes.—A numerous genus of scaly-rooted plants belonging to the *Gesneraceæ*, the majority of which form splendid ornaments in the plant-stove. For soil, use loam, peat, leaf-mould, and good well-decayed manure, in equal parts, adding a fair proportion of sand. If a succession of these plants is required, some of the tubers should be started monthly; as the stems are slender, they require careful staking, and this should be done early when the plants are small. *Achimenes* luxuriate in strong heat and moisture, and partial shade; but when in bloom they may easily be hardened off to stand in a cool green-house. As they show signs of decay, gradually reduce the supply of water until the tops are all dead, after which keep them dry until the following spring. Stove.

A. Admiration — flowers large, deep rose, with light throat.
A. Advance—deep reddish-purple; spotted eye.
A. Ambroise Verschaffelt—pale lilac, streaked with violet, and spotted with orange.
A. Argus — deep plum-colour, spotted carmine; orange eye.
A. Celestial—light blue; eye purple and cream-colour.
A. Cherub — large, white, shaded with blue on the edges.
A. Diadem—magenta-carmine; eye golden-yellow.
A. Eclipse — orange-red, spotted carmine.
A. Harry Williams—cerise; eye yellow and mauve, spotted with maroon.
A. Lady Lyttleton—magenta-crimson; eye orange-yellow.
A. longiflora alba—flowers large; pure white.
A. longiflora major—very large; clear blue.
A. Marvel—rosy-violet, with light throat.
A. Masterpiece—rich rose, shaded violet.
A. Mauve Queen—flowers large, mauve; chocolate eye.
A. nesida—soft lilac, with yellow centre.
A. Oberon — bright blue, white centre; eye purple.
A. Pink Perfection—rosy-pink, shaded violet; eye carmine.
A. purpurea elegans—deep claret; throat spotted orange.
A. Rival—rich deep puce.
A. Rose Queen—rosy-lake, shaded purple; orange eye.
A. Scarlet Perfection—rich bright scarlet; orange eye.
A. Sparkler—rich deep scarlet.
A. Stella—magenta, spotted carmine; orange eye.
A. Unique—soft rosy-pink, dotted scarlet; yellow eye.
A. vivicans—carmine, shaded with blue; crimson eye.
A. Williamsii — brilliant scarlet; orange eye.

Alstrœmeria.—The plants comprising this genus, though belonging to the *Amaryllis* family, are not strictly bulbous, the roots in the majority of

the species being fleshy and tuberous, somewhat resembling the tubers of the Potato. It is a numerous genus, and there is scarcely a species that is not showy; but only a few are in cultivation, and these, unfortunately, are peculiarly constituted as regards their hardiness. They are natives of the western part of South America, particularly in the Andes of Peru and Chili, consequently they require a somewhat warmer climate than ours. This difficulty would be overcome if the plants were amenable to pot-culture, which they are not, on account of the widely-spreading roots, which abhor being cramped for space. Consequently we can only grow the few species that are either hardy enough to be grown in the ordinary border, or those that flourish if planted in a light soil at the foot of a south wall. Happily one of the finest is perfectly hardy in light soils, and is no trouble to cultivate. This is *A. aurantiaca*, a plant inhabiting the island of Chiloe, whence it was introduced to this country many years ago. It is, indeed, a beautiful plant, and totally different from all other hardy herbaceous perennials. Its average height, when full-grown, is about three feet, the erect, slender stems being clothed with glaucous foliage. It flowers from June to August, almost continuously, in large, broad clusters on the top of the stems. The flowers vary from a clear yellow to a warm orange-red, and invariably are marked by transverse bars of dark brown on the petals. There is a variety bearing larger flowers than those of the ordinary kind, and this is the one to select when obtainable. Though this plant is perfectly hardy in light soils about London, it is not so in stiff soils in the Midland and Northern counties, except the roots are protected in winter by a covering of dead leaves or ashes. It thrives best in a deep sandy loam in a warm spot, the sunnier the better; a mulching of manure now and then greatly assists the plants. In planting it the roots must be planted quite a foot beneath the surface if the soil is light, and care must be taken that they are not broken in the operation. In heavy soils a few inches in depth will suffice, as extra covering in winter would protect the roots.

Various Achimenes.

It is best to transplant in autumn or in early spring before growth commences. Like many other perennial plants, this *Alstrœmeria* is most satisfactory when allowed to remain undisturbed, provided the conditions under which it is growing are favourable to it. It may be increased readily by the offshoots, which it produces plentifully around the main roots. These should be dug up in autumn or early spring, and re-planted immediately. Seedlings may also be raised, as seeds are produced and ripened in most seasons. These should be gathered as soon as thoroughly ripe, and sown in pots three or four together, and placed in a frame. Flowering plants may be raised from seed in about a couple of years. A few masses of this *Alstrœmeria* in a garden are great ornaments when in bloom, the margins of shrubberies, mixed borders, or isolated groups on lawns being their special places. This species is also named in catalogues *A. aurea*, and sometimes this name stands for a variety of *A. aurantiaca* with flowers of a clear yellow.

Other *Alstrœmerias* to be found in gardens, and which are worthy of cultivation, include the following: *A. Pelegrina*, a dwarf plant, bearing large pink flowers, spotted and barred; in the variety *albescens* the flowers are greenish-white. The latter is a very handsome plant. *A. Ligtu* is inferior in beauty to the last-named species, and other species of a similar character are *A. hœmantha* and *A. pulchella*, and *A. versicolor*. These have long been in cultivation, and having been continually propagated by seed, they have become so intercrossed that instead of the original species we have a race of hybrid sorts, which the Dutch bulb-growers collectively term *A. Chilensis*, by which name these hybrid *Alstrœmerias* are generally known in the trade. This race of hybrids are all beautiful, and remarkable for the richness and diversity of their colours, which range from reds to pinks, whites to orange and yellow. As a rule they are too delicate for growing in the open borders in the usual way. They require a warm light soil, and a snug sheltered corner, such as may be found outside hot-houses and other garden buildings. In such positions they thrive well, and

flower year after year without further trouble. Even in the most favoured spots it is always best to protect the roots in winter by a covering of leaves or ashes. These *Alstrœmerias* may be easily raised from seeds, which should be sown in pans and placed in frames. If seed is sown as soon as ripe in autumn, the seedlings will flower the following season. They may be also increased by dividing the fleshy roots. If the plants are left undisturbed for several years they form quite a network of roots, which keeps the border well drained, and renders it warm. *A. psittacina*, or *A. Braziliensis*, is as hardy as *A. aurantiaca*, but is scarcely worth growing, the flowers not being nearly so showy.

Amorphophallus.—These remarkable plants belong to the order *Araceæ*, and were formerly included in the genus *Arum*. Pot in rich loam and sand. They enjoy an abundance of water when growing, but none when at rest. Stove.

A. campanulatus—this gigantic Arad produces but a single leaf, which is borne on an erect footstalk, upwards of six feet in height, the blade being divided into numerous spreading segments. The flower is borne close to the ground; the spathe is large and spreading, the spadix thick and fleshy, and clubbed at the top; it emits an offensive odour, resembling carrion. East Indies and Pacific Islands.

A. dubius—this species is about one-fourth the size of the preceding, of which it may be called a miniature. Ceylon.

A. Lacourii—petioles stout, erect, pale green, irregularly banded with yellow and grey, resembling the body of a toad; leaves deep green, spotted and dotted with white. Cochin China.

Anchomanes.—A small genus of Arads, with tuberous roots. The flowers appear before the leaves, and are enveloped in a very large spathe. Pot in loam and leaf-mould. Stove.

A. Hookeri pallida.—This form differs from the species in its paler flowers, and in being furnished with a greater quantity of spines; petioles three to four feet high, blade thrice divided, leaflets large and deep green, spathe large; dull purple, the interior being also tinged with green. Fernando Po.

Anthericum (*St. Bruno's Lily*).—Though this genus of Lilyworts numbers so many species, there are only two or three valuable as garden plants, and one of these, the St. Bruno's Lily (*A. liliastrum*), is an indispensable hardy plant. This lovely plant inhabits the high alpine meadows of Central Europe. When fully grown it reaches from two to three feet in height. It bears a tuft of narrow foliage, and amidst this the tall, erect flower-spikes rise in early summer. The flowers somewhat resemble the White Lily in miniature, being of snowy whiteness, and clothe the spike for about half its length, opening one after the other in quick succession. There are two forms of the plant—the original, and a much larger variety known as *majus*. The latter variety is much the finer plant, and should always be preferred to the original, as it grows nearly twice the size, and all its parts are proportionately larger. The soil that suits the St. Bruno's Lily best is a deep, moist, sandy loam, overlying a cool subsoil, as it is apt to suffer during a spell of dry, hot weather in summer, if the soil is hot and dry. It likes an open, sunny spot, yet sheltered from winds. For a shrubbery border it is an excellent subject, and worth a good deal of attention. In some nurseries it is grown under the names of *Paradisea* and *Czackia*.

There are two other species of *Anthericum* worth attention. These are St. Bernard's Lily (*A. liliago*) and *A. Hookeri*, known also as *Chrysobactron Hookeri*. The first is a graceful plant, growing from one to two feet high, and bearing numerous small white blossoms. A similar plant is *A. ramosum*, also called *graminifolium*, but neither of these plants is first-rate. *A. Hookeri* is a New Zealand plant, quite distinct from the other species. It has small dense spikes of bright yellow flowers. It is a desirable plant for growing in boggy borders, or by the margins of streams, as it is very partial to moisture.

Arisœma.—A genus of comparatively small-growing plants, with pedate, digitate, or trifoliate leaves, and in many instances curious and handsome spathes. Pot in loam, leaf-mould, and sand; when growing, water freely; when at rest, withhold the supply. Stove.

A. concinnum—leaves digitate, dark green; spathe tubular at base, the upper portion recurved and lengthened into a tail-like point; white in the male plant, longitudinally striped with broad bands of deep purple; in the female white, banded with green. Spring months. Sikkim.

A. curvatum—leaves pedate, deep green, petioles mottled with greenish-purple, spathe green and purple. Spring months. Sikkim.

A. præcox—leaves trifoliate, deep green above, paler beneath; spathe tubular, hooded, longitudinally streaked with white and green; mouth deep purplish-black. Spring months. Japan.

A. speciosum—leaves large, trifoliate, deep green on the upper side, bordered with red; petiole stout, green, mottled with brown; spathe upwards of six inches high, deep purple, with a few white stripes inside; spadix lengthened into a flexuose tail nearly two feet in length, and reddish-brown in colour. Spring months. Sikkim.

A. Wightii—leaves radiate, leaflets five, elliptical-lanceolate, tapering to a very fine point; bright green, paler beneath; spathe yellowish-green, streaked with deep green; spadix same colour, lengthened into an erect awl-like point six inches long. Ceylon.

Blandfordia.—A group of handsome plants, less frequently seen in our plant-houses than they deserve. They belong to the Lily family, and are plants of very easy culture. Autumn is the best time for re-potting, and good light loamy peat is the soil they thrive best in; during winter they should

have but little water given them, but in the growing season they enjoy an abundant supply; when at rest keep them quite cool, for if they get excitement during winter they grow very weak and do not produce flowers. Blandfordias, we are told, grow naturally in hilly bogs from "Tasmania to Queensland, but are not found in the western or northern half of the Australian continent."

B. aurea—leaves about a foot long, Grass-like and pale green; flowers large, campanulate, rich yellow, borne upon erect scapes upwards of a foot high. June and July. New South Wales, 1869.

B. Cunninghamii — leaves distichous, some two feet in length, about half an inch broad, light green above, but lighter on the under surface. The scape erect, and upwards of two feet high, bearing a grand cluster of large and extremely handsome blooms, individual flowers conical, two inches in length, and with a spreading limb; the segments are rich golden-yellow, the greater portion of the tube, however, being reddish-orange. One of the finest introduced, and a profuse bloomer. New South Wales, 1868.

B. flammea—a strong-growing plant, producing from between its narrow distichous leaves a scape from two to three feet in height; flowers numerous, pendulous, spreading at the mouth; the segments deep yellow, the tubes being deep orange-red. Summer months. New South Wales, 1849.

B. flammea, var. princeps—this is by far the finest of the cultivated Blandfordias, and well deserves a place in every collection of green-house plants. Like the previously named kinds the leaves are narrow, and distichous, scape erect, bearing a dense corymb of large and richly coloured-blooms; individual flowers slightly pendulous, some two inches or more long, spreading, bright crimson, with golden-yellow segments. Summer months. New South Wales.

B. nobilis—this species has been in cultivation many years, and although not as showy as those previously named, is a truly handsome plant; flowers large, pendulous, produced in terminal corymbs, orange-red, with the margins bright yellow. June and July. New South Wales, 1803.

Bomarea Carderii.

Bomarea.—A genus of climbing Amaryllidaceous plants of great beauty, and elegant objects trained upon a pillar or rafter. Pot in light sandy loam and leaf-mould, drain well, and water freely. Green-house.

B. Caldasiana—leaves subcordate, acuminate; the flowers produced in terminal umbels, bell-shaped, and pendulous, outer segments fiery-scarlet, inner ones orange-yellow, dotted with red.

B. Carderii—all the species are similar in growth; flowers large, pendulous, in terminal umbels; soft rosy-pink, dotted near the mouth with purple. Columbia.

B. Kalbreyeri—flowers numerous, outer segments bright red, inner ones orange-yellow. South America.

B. Patacocensis — umbels very large; flowers long, bell-shaped, and rich deep crimson.

Caladium. — Handsome Arads, with, for the most part, parti-coloured leaves, which are great favourites for decorating the stove in summer. Pot in loam, peat, leaf-mould, rotten manure, and sand, in about equal parts, drain well, and water freely when growing, as they luxuriate in strong heat and moisture. As the leaves begin to decay in autumn, gradually reduce the supply of water, until the whole of the leaves have fallen, when they should be removed to a lower temperature—not, however, less than 60° — and very little moisture given, but it should not be entirely withheld. The following is a good selection:—

Adolphe Adams.
Albo-luteum.
Alcibiade.
Alfred Mame.
Alphonse Karr.
Amœnum.
Argyrites.
Baraquinii.
Barillet.
Baron de Rothschild.
Beethoven.
Bellemei.
Bicolor splendens.
Calypso.
Candidum.
Cardinale.
Chantinii.
Chelsonii.
De Candolle.
Gerard Dow.
Golden Queen.
Laingii.
Meyerbeer.
Ornatum.
Prince Albert Edward.
Prince of Wales.
Princess of Wales.
Princess Alexandra.
Princess of Teck.
Reine Marie de Portugal.
Reine Victoria.
Salvator Rosa.
Souvenir de Dr. Bleu.
Souvenir de Madame Bernard.
Verdi.
Virginale.

Curcuma.—A large genus of *Zingiberaceæ*, containing many species of great economic value, and also others remarkable for the beauty of their flowers; of the former, *C. rotundata*, and *C. longa*, produce turmeric, so largely used in the preparation of curry and pickles; *C. angustifolia* produces East Indian arrowroot, and various tonics and perfumes are produced by other species. The kinds which are grown in our hot-houses for the beauty of their flowers are plants of easy culture; they should be

potted in a compost of two parts of peat, one of loam, and one of sand; drain well, and water freely. When the leaves decay, very little water is necessary, but do not thoroughly dry them, or the tubers will get dry rot and fall into powder. Stove.

C. Australasica—a species with lanceolate leaves, upwards of a foot long, light green; flowers yellow, produced in a cylindrical spike, and enveloped in large bracts, the lower ones green, the upper ones bright rosy-red, rendering it very effective. Autumn months. North-east Australia.

C. cordata—leaves ovate-cordate, and tapering to a point, slightly hairy; deep green; spike cylindrical; flowers yellow, bracts green and red, upper ones rich violet. Summer and autumn months. East Indies.

C. petiolata—leaves broadly oblong-lanceolate, tapering to a point; deep green above, paler below; spike cylindrical; flowers pale yellow, lower bracts yellowish-green, bordered with rosy-pink; upper ones rich, bright, rosy-purple. Autumn months. East Indies.

C. Roscœana—leaves broadly ovate, deep green; spike cylindrical; the flowers orange-yellow, enveloped in rich scarlet bracts. Autumn months. East Indies.

Dioscorea.—A very large family of twining plants, the typical genus in the order *Dioscoreaceæ;* the roots of many of the kinds, under the name of Yams, are extensively used for food in those countries where the climate is suitable. Yams vary much in size, colour, and weight, according to the species. The principal kinds grown for food are *D. rubella*, *globosa*, *purpurea*, *aculeata*, *fasciculata*, *alata*, and *sativa*. The ornamental-leaved sorts are admirably adapted for the decoration of pillars and rafters in the stove. Being tuberous-rooted, they require resting in winter, but they must not be put into a cold place. Pot in peat, leaf-mould, rotten manure, and sharp sand, in about equal parts; give plenty of root-room, and an abundant supply of water when growing; as they show signs of decay, gradually reduce the supply, and rest them through the winter in a dry state. Stove.

D. Anœctochilus — leaves broadly-ovate, tapering to a point; when young, bright green, changing with age to deep olive-green, beautifully marbled with golden blotches, and having a broad golden band through the centre. Amazon Valley.

D. argyrea—leaves cordate, deep green; the veins, which are prominent in all this family, are bordered with silvery-grey in irregular blotches. Columbia.

D. chrysophylla—leaves cordate-acuminate, ground-colour of a rich bronzy hue, with a broad band of gold on the midrib, and in addition, irregularly freckled with rose. South America.

D. discolor—leaves large, cordate, ground-colour a deep green, irregularly marbled with various shades of green; the reverse side port wine colour. South America.

D. discolor vittata — this variety, in addition, has a broad metallic-white band down the centre of the leaves. South America.

D. Eldorado — leaves cordate-acuminate, bronzy-green, the veins banded with silvery-white, upon which are numerous dots of a golden hue. Brazil.

D. illustrata—leaves large, bluntly cordate, ground-colour deep olive-green, with a central band and various irregular patches of metallic-grey; the reverse side is vinous purple. Brazil.

D. melanoleuca—leaves cordate-acuminate; a deep brilliant green, with a central band of silvery-grey, and various irregular blotches of the same colour on the principal veins. Brazil.

D. metallica — leaves cordate; ground-colour rich bronze, with a central band of creamy-pink. Brazil.

D. prismatica—the leaves of this magnificent form are large, broadly heart-shaped and acute; ground-colour olive-green, shaded with emerald-green and crimson, with a band of silvery-grey down the centre, and all the primary veins as well as the transverse ones white; reverse side vinous purple. Peru.

D. sagittaria—leaves halbert-shaped; the ground-colour light green, blotched between the veins with silvery-white. Brazil.

Gesnera.—This genus gives its name to the order *Gesneraceæ*, but has been much subdivided; thus some of the old favourites have become *Nægelias*, *Eucodonias*, *Kohleias*, *Houtteas*, &c. &c., whilst garden varieties have sprung up and been established as new genera, such as *Biglandularia*, *Plectopoma*, *Rosanowia*. They all, however, require the same treatment, and their differences are so immaterial to the cultivator that we purpose treating them all together. By having a good selection of these plants, and treating them judiciously, their flowers may be had in perfection nearly the whole season. *Gesneras* and their allies thrive best in a compost of fibrous peat two parts, light loam and leaf-mould one part each, adding a little rotten manure and sharp sand; the pots should be drained well, as they enjoy an abundant supply of water to their roots, and moisture in the atmosphere, but they dislike water sprinkled over their leaves; gradually withhold water when the leaves begin to wither, but do not allow the roots to shrivel, or their next growth will be weak, and probably without flowers. Many cultivators remove the bulbs from the pots after growth is complete, and store them in sand. This system is convenient, but we prefer to let them remain in the old soil until growth commences again. The following list contains some of the best kinds in cultivation :—

G. Adelina — white, with yellow throat.

G. amabilis—snowy-white, stained with lemon in front.

G. aureo-roseum—tube rosy-lilac, lower part of limb spotted with carmine; throat orange.

G. Barlowii—salmon, with a few darker spots in the throat.

G. Blassii—fine clear scarlet.

G. Candida — pure white, with yellow throat.

G. Cerise d'Or—tube cherry-red, limb and throat golden-yellow, spotted with red.

G. cinnabarina—tube and limb rich cinnabar-red; leaves densely covered with fiery-red hairs.

G. citrino-amarantina—yellow, banded and dotted with amaranth.

G. Cliftoni—upper half of flower a rich vermilion; lower golden-yellow, and dotted with crimson.

G. Cooperii—tube brilliant scarlet; throat much spotted.

G. Donklarii — tube red; limb spreading; throat yellow.

G. Exoniensis—rich orange-scarlet; throat yellow.

G. Leichtlenii—rich yellow, bordered with rose.

G. lilacinella—flowers large, lilac, marbled with deep mauve.

G. lutea-punctatissima—brilliant yellow, spotted with crimson on the throat.

G. macrantha—tube bright crimson, clothed with short hairs; throat white, streaked with black.

G. Madame A. Lacomble—pure white, netted with rose.

G. Madame Van Houtte—tube bright rose; limb

white, spotted with carmine.
G. multiflora—pure white, with yellow throat.
G. purpurea — tube bright rose, spotted with rosy-purple.
G. refulgens—rich violet, spotted with buff throat white.
G. Rose d'Amour — rose, spotted with white; the throat white, lined with pale yellow.
G. Sceptre Cerise—deep cerise, spotted with golden-yellow.
G. Sceptre Royal — coral-red; the throat yellow, spotted with bright scarlet.
G. striatella — tube flesh-colour; the limb yellow, and striped with rich purple.
G. Van Houttei—brilliant carmine and white, and striped with rose.

Gloriosa.—This genus, said to be more correctly named *Methonica*, has been long in dispute, its natural affinities not being clearly understood. Some botanists place it in the order *Liliaceæ*, whilst others place it with *Melanthaceæ*, with which the peculiar solid corms would seem to agree better than with the Lilies. There are but few species, and all are beautiful, although they have the character of being very poisonous. They are climbing plants, and produce large showy flowers; the lobes of the perianth are all reflexed, forming a kind of corona; the long style is obliquely bent a little above the ovary, and the stigma is three-cleft. Pot in rich, light soil, composed of loam, peat, leaf-mould, rotten manure, and sharp sand, in about equal parts. When they begin to grow, they enjoy an abundance of heat and moisture, but when in bloom they last longer in flower if the temperature is reduced; after flowering, as the leaves decay, reduce the water supply. Stove.

G. grandiflora—the leaves of these plants are all sessile, and furnished with a long tendril at the apex, by which they support themselves by clinging to other plants; the flowers bearing six petals, which turn back until their points meet; bright sulphur-yellow. Summer and autumn months. West Africa.
G. superba—petals reflexed, the lower part rich orange, and crispate; upper part a brilliant red. Summer and autumn months. East Indies.
G. virescens—petals all reflexed, spathulate in shape, and not crispate at the sides; deep rich orange and yellow. Summer and autumn months. South Africa.

Godwinia.—*G. gigas* is the only species in the genus, being perhaps the most gigantic Arad at present known. The peduncle is about five feet high, and yellowish-white, irregularly banded with brown, and resembling the body of a snake; this is surmounted by an erect hooded spathe, upwards of two feet high, dull purple, tinged with greenish-yellow at the base; petiole stout, about ten feet high, green, banded irregularly with brown; the blade is thrice divided, the divisions pinnatifid, dark green, and upwards of three feet across. Pot in loam and leaf-mould. Nicaragua.

Hedychium.—A handsome genus of *Zingiberaceæ*, many species of which produce showy fragrant flowers. They require the same treatment as *Curcuma*, but plenty of pot-room to develop their beauties, and they well deserve general cultivation. Stove.

H. angustifolium—a fine species growing some five feet high, with long, dark green, linear-lanceolate leaves, and large terminal heads of bright scarlet flowers. Summer months. East Indies.
H. coronarium — leaves broadly-lanceolate and dark green, producing close compact heads of yellow fragrant flowers. Summer months. East Indies.
H. Gardnerianum—this is a tall-growing plant, producing large, loose heads of bright yellow flowers during summer and autumn. East Indies.
H. heteromalum—a somewhat dwarf species; leaves lanceolate-acuminate, and clothed on the under side with white silky hairs; flowers yellow, produced in a large conical head. Summer months. East Indies.

Kœmpferia.—A curious genus of low-growing, stemless plants, belonging to the Ginger (*Zingiberaceæ*). The roots of some of the kinds are used medicinally, and others in perfumes; they require the same treatment as *Curcuma*. Stove.

K. Parishii—like all the species, the flowers of this plant appear before the leaves; the latter are oblong-lanceolate, and taper to a point; pale green on the upper side, yellowish-green below. The flowers rise but a few inches from the ground, upper portion pure white, the two lower lobes intense deep purplish-violet. Summer months. Moulmein.
K. Roscœana — leaves large and spreading, suborbicular, intense deep bottle-green, relieved by flakes of emerald-green; flowers small, pure white. East Indies.
K. rotundata—leaves lanceolate-acute, a foot or more long; pale green; the central portion of a darker shade; lower side vinous red; flowers very fragrant, rising but a few inches from the surface; upper portion white, margined and suffused with pink; lower lips bright purplish-carmine. Spring months. East Indies.

Littonia.—A genus of *Melanthaceæ*, nearly allied to *Gloriosa* and *Sandersonia*, and requiring the same treatment.

L. modesta—with much of the habit of Sandersonia, this plant is more robust, and is furnished with a strong spiral tendril at the end of the leaves, like Gloriosa; these leaves are sessile and bright green; the peduncle springs from the base of the leaf, bearing a solitary bell-shaped, rich orange-coloured flower, which is open at the mouth, with narrow spreading lobes. Summer and autumn months. Natal.

Mantisia.—A genus of Gingerworts, popularly known as "Opera Girls," from the fancied resemblance of the flowers to a dancer; hence the specific name of the only species, whilst the generic name comes from the supposed resemblance of its flowers to the group of insects called Mantis. Though this plant has been in cultivation for about a century, it has always been scarce, from being over-dried when at rest. Pot in peat, loam, leaf-mould, and sand, in equal parts, and water freely when growing. Stove.

M. saltatoria is a slender Reed-like plant, with small ovate-lanceolate leaves, which are lengthened out into slender points, deep green; the flowers, which are purple and yellow, are produced on branching spikes, and surrounded with large purple bracts. Summer. East Indies.

TERRESTRIAL ORCHIDS.

Ophrys and Orchis, &c.—These genera belong to the order *Orchidaceæ*, and include the terrestrial members, all of which have tuberous roots, and as there are various other genera of terrestrial Orchids with tuberous roots, they are gathered together here under one head, as they all require about the same treatment. Many of the kinds enumerated below are natives of this country; others are found in the South of Europe, some of the most beautiful in those districts bordering upon the Mediterranean; and, although not so showy or conspicuous as many of the epiphytal kinds from tropical countries, their quaint forms and beautiful combinations of colours must endear them to all true lovers of plants.

Very few of these plants thrive long as ordinary border flowers, therefore it is advisable to plant them in the rock garden in such places as will afford them partial shade in the course of the day. Where such a spot is not at the command of the would-be cultivator of terrestrial Orchids, then try a frame, if composed of turf so much the better. In such a structure we have grown and flowered these plants admirably; they may be planted out, or grown in good-sized pots; we prefer the latter, for convenience sake, as each kind can then have the particular soil they best enjoy. The bottom of the frame must be well drained, and the surface covered with ashes, so as to keep worms away, and the pots plunged in sphagnum moss. Treated in this manner, water may be given freely, and when the tops have all withered and the roots are lying dormant, anything may be laid over the frame in very severe weather. The subjoined list contains many beautiful forms, arranged in accordance with the soil they require:—

SECTION I.—LOAM, CHALK, OR LIMESTONE.

Aceras anthropophora.
Cephalanthera ensifolia.
Cephalanthera grandiflora.
Cephalanthera rubra.
Cypripedium calceolus.
Cypripedium parviflorus.
Epipactis rubiginosa.
Epipogon gmelina.
Gymnadenia conopsea.
Gymnadenia odoratissima.
Herminium monorchis.
Limadorum abortivum.
Limadorum sphærolabium.
Listera nidus anis.
Listera ovata.
Neottia cernua.
Neottia spiralis.
Nigritella angustifolia.
Ophrys apifera.
Ophrys arachnites.
Ophrys arinifera.
Ophrys atrata.
Ophrys Bertolini.
Ophrys bombilifera.
Ophrys cornuta.
Ophrys exaltata.
Ophrys funerea.
Ophrys fusca.
Ophrys fusca grandiflora.
Ophrys lunulata.
Ophrys lutea.
Ophrys muscifera.
Ophrys neglecta.
Ophrys pallida.
Ophrys speculum.
Ophrys tenthredinifera.
Orchis hircina.
Orchis longibracteata.
Orchis macra.
Orchis mascula.
Orchis militaris.
Orchis morio.
Orchis sambucina.
Orchis sulphurea.
Orchis ustulata.

SECTION II.—LOAM, LEAF-MOULD, PEAT, AND SAND.

Arethusa bulbosa.
Calopogon pulchellus.
Cypripedium acaule.
Cypripedium arietinum.
Cypripedium candidum.
Cypripedium guttatum.
Cypripedium Japonicum.
Cypripedium macranthum.
Cypripedium occidentale.
Cypripedium pubescens.
Cypripedium spectabile.
Epipactis palustre.
Goodyera pubescens.
Goodyera repens.
Habenaria bifolia.
Habenaria blephariglottis.
Habenaria bracteata.
Habenaria chlorantha.
Habenaria ciliaris.
Habenaria nivea.
Lissochilus speciosus.
Listera cordata.
Malaxis paludosa.
Orchis Brancifortii.
Orchis coriophora.
Orchis fragrans.
Orchis latifolia.
Orchis latifolia incarnata.
Orchis latifolia lagotis.
Orchis laxiflora.
Orchis longicornis.
Orchis maculata.
Orchis maculata superba.
Orchis panormitana.
Orchis papilionaceæ.
Orchis patens.
Orchis pauciflora.
Orchis pyramidalis.
Orchis Robertiana.
Orchis saccata.
Orchis Stabiana.
Orchis Traunsteineri.
Orchis tridentata.
Orchis undulatifolia.
Orchis undulatifolia purpurea.
Plalanthera chlorantha.
Plalanthera incisa.
Satyrium aureum.
Serapias cordigera.
Serapias lingua.
Serapias longipetala.
Serapias neglecta.
Serapias parviflora.
Serapias Totardi.

Proteinophallus (*Rivieri*).—An Arad differing from the genus *Amorphophallus* in some few points of its structure. It has a very large tuber, and the petioles attain a height of eighteen or more inches; slender, streaked, and banded with chocolate; blade of leaf some two feet across, thrice divided, the divisions pinnatifid; deep green; peduncle slender, erect, double the height of the petiole, deep green, bearing on its summit an enormous campanulate spathe; the base yellowish-green, ornamented with dark green spots; the spreading portion of the spathe port wine colour, with a metallic lustre. Pot in rich loam. Cochin China.

Sandersonia.—This is a genus belonging to the same order as *Gloriosa*, and is, indeed, nearly related to it; it differs in habit, however, being an erect plant, and entirely destitute of the tendril at the apex of the leaf, which is such a marked feature in *Gloriosa*; it requires exactly the same treatment as given for the last-named genus. Stove.

S. aurantiaca — a slender-growing plant, with sessile, ascending, ovate-lanceolate, acuminate leaves, which are strongly nerved, thin in texture, and bright green; peduncles solitary from the base of the leaves, pendulous, bearing a single large bell-shaped flower, of a rich deep orange-colour. Summer and autumn months. Natal.

Sanguinaria.—*S. Canadensis* is the only member of the genus, which belongs to the Poppy family; the popular name is Blood-root; its fleshy roots, when cut or bruised, discharging an orange-red-coloured fluid, which was in great demand by the "Indians" for staining their bodies red. It attains a height of about six inches; leaves large, reniform, more or less lobed, deep green; flowers pure white and very showy, but very short-lived. It enjoys rich, well-drained soil, and partial shade. Hardy. North America and Canada.

Sauromatum.—From *saura*, "a lizard," in reference to the shape and colour of the spadix; it is a small genus of *Araceæ*, and should be treated in the same manner as *Caladiums*. There are several species, all being more or less ornamental. Stove.

S. guttatum—tuberous root-stock globular, from which springs a single stem, which is curiously mottled, bearing a large pedately-divided, deep green leaf; the spathe, which appears before the leaf is large, tubular at the base, spreading in front, and lengthened out into a long tail; green, profusely spotted with reddish-purple, bordered with red; spadix long and curved. Northern India.

Tropæolum. — The annual members of this genus are popularly known as Nasturtiums; they belong to the order *Tropæolaceæ*, and would appear to be closely allied to the Cranesbill family, *Geraniaceæ*. The name comes from *tropæum*, "a trophy," from the fact of the flowers resembling a helmet, and the leaves a shield. These plants enjoy good rich soil and thorough drainage; the green-house kinds should have a wire trellis to scramble over, and the hardy kinds make a fine appearance on rockwork, and especially when growing through and amongst tall shrubs; these latter may be left in the ground through the winter, but the green-house species require to be kept dry after the leaves die away.

T. azureum—a slender scandent plant, having small peltate leaves, with from five to seven ovate, dark green segments; the flowers produced singly upon slender peduncles, and bright blue. Green-house. Spring months. Chili.

T. brachyceras—similar in growth to the preceding, with bright yellow flowers. Green-house. Spring months. Chili.

T. Jarratti—leaves peltate, divided into entire dark green segments; flowers rich scarlet and yellow. Green-house. Spring months. Chili.

T. polyphyllum — this plant reaches some three or four feet in length; leaves orbicular, dense, the segments overlapping each other, and very glaucous; the flowers freely produced, rich yellow. Hardy. Summer months. Chili.

T. speciosum—a beautiful climber, with large leaves divided into six segments; flowers rich vermilion-scarlet. Hardy. Spring and summer. South America.

T. tricolorum—similar in habit to azureum; flowers rich orange-scarlet, yellow, and black. Green-house. Spring months. Chili.

T. tuberosum—a scandent plant several feet long, with peltate five-lobed leaves, and bright yellow flowers. Hardy. Spring months. Peru.

Orchis Mascula.

Tydæa.—A genus of *Gesneriaceæ*, with scaly roots, called lepicorms, stout stems, and a profusion of handsome flowers, and as they are for the most part winter and early spring bloomers, they are doubly valuable. The majority of the finest kinds are garden varieties, but the home of the species is South America, where they and their allied genera exist in vast numbers. Pot in loam, leaf-mould, rotted manure, and sand, in about equal parts. They will not require much stopping to make them bushy, but should be kept staked to keep them in proper shape, and to admit light and air to their foliage. The majority of these beautiful plants have slender lepicorms, and we have found that where this is the case they cannot withstand a great amount of drying, so during the resting season care must be taken, or many of them will go to rest never to awake. The following will be found a good selection. Stove.

Adonis—white, blotched and spotted with vermilion.

Alarm—rosy-purple, spotted with purplish-crimson.

Amabilis—vermilion, dotted on the limb with a darker hue.

Apollon—rich violet, dotted with brown.

Belzebuth—tube carmine; limb deep crimson, heavily spotted with black.

Calypso—tube rich crimson; limb yellow and crimson, spotted with maroon.

Cecilia — tube pink; limb rosy-red, streaked and spotted with crimson.

Ceres—tube brilliant red; limb white and vermilion, dotted with crimson.

Cerise—tube cherry-red; limb creamy, spotted and striped with rich crimson.

Countess of Ilchester—rich crimson, bordered with violet; yellow throat, striped with carmine.

Cratere—a bright flame-colour, striped with black.

Euterpe—tube vermilion; limb white and amaranth, spotted with vermilion.

Floretta — rich magenta; limb cream-colour, spotted with magenta.

Formosa—rosy-lake, spotted with crimson.

Hector—tube vermilion; limb pale yellow, spotted with velvety crimson.

Hepatica—tube rosy-purple; limb white and magenta, spotted with intense crimson.

Jupiter—tube bright red; limb pale yellow, spotted with crimson.

Lady Caroline Kerrison—tube orange-scarlet; limb soft rose, spotted with violet.

Leandre—tube deep red; limb white, mottled with cherry-red.

Leonidas—tube bright red; limb pale yellow and deep red, spotted with cerise and vermilion.

Lorenzo—tube carmine; limb pale yellow, dotted with crimson.

Minerve—tube purple; limb a rich violet, spotted with crimson.

Ophir — rich vermilion; limb spotted with black and yellow.
Peronilla — deep carmine; limb dotted with purple and maroon.
Polymnie — tube white; limb scarlet, spotted with carmine.
Rachel — a rich scarlet, streaked and spotted with deep purple.
Rio Carotte — tube orange-scarlet; limb yellow, spotted with orange.
Seraph—tube purple; limb white, spotted with rich crimson.
Tricolor—tube coral-red; limb white, spotted with light purple.
Wonder—brilliant orange-scarlet, streaked with purplish-black.

Zingiber.—This genus gives its name to the order *Zingiberaeceæ;* the roots of one species, *Z. officinale*, yielding the ginger of commerce. There are numerous kinds, but very few are in cultivation. Treatment same as for *Curcuma*. Stove.

Z. officinale is a slender-growing plant, with Grassy or Reed-like stems; leaves linear-lanceolate, smooth, and pale green; the flowers are surrounded with bracts, and are produced in oblong spikes; bright red. Summer months. East Indies.
Z. Parishii—stems slender, Reed-like, and leafy, two to three feet high; leaves lanceolate-acute and deep green; spike cylindrical; flowers pale yellow, tessellated on the lower part with purplish-brown; bracts yellowish-green, and bordered with red. Summer months. Moulmein.

NUTS, WALNUTS, AND CHESTNUTS.

By D. T. Fish.

THE HAZEL-NUT AND FILBERT.

THE Hazel-nut was known and eaten in the earliest times, and was doubtless used to some extent as food when Hips, Haws, Sloes, and Crabs were not despised for that purpose. But though a native plant, hardy and fruitful, and cultivated in gardens and orchards, as well as grown in woods and coppices for a thousand or more years, it seems strange that probably more than half the Nuts consumed in England are imported from Spain and other countries. Neither can it be said that the foreign Nuts are the best. No doubt the bulk of them are far superior to the average Hazel-nuts of our copses, which enjoy little light and no culture. But few foreign can equal, none excel in quality the best Kentish and other Nuts, such as Cobs, Bond, and Cosford Nuts, and Filberts, grown in the gardens and orchards of England.

It may be well at the threshold of our subject to unravel the mystery that many lovers of Nuts have never been able to solve—the difference between Nuts and Filberts. Well, the difference lies in the length of their beards, that is, their husks. When the Nuts exceed the husks in length, they *are* Nuts; when the husks are longest, the Nuts are draperied into Filberts; where Nuts and husks are equal, the products are either Nuts or Filberts. It is therefore a popular error to assume, as is often done, that Filberts are superior to Nuts. In length, or beauty of appendages, they may be, but not in quality, and no sooner do the Filberts cast off their husks than they return to the level of simple undecorated Nuts.

Propagation.—Nuts of all kinds are rapidly multiplied by seeds, suckers, and layers. Particular varieties may also be perpetuated by grafting and budding; but as the former means of increase are so easy, and the latter more difficult, they are seldom resorted to. Grafting by any of the ordinary methods may be successfully performed in February or March, and budding in June or July.

Occasionally two other species, the Constantinople Nut, *Corylus Colurna*, and the American Nut, *C. Americana*, are used for stocks. The latter especially grows vigorously, and standards at once ornamental and useful may be produced by budding the Purple or Cut-leaved Filbert on these stocks, or on strong stems of the common Nut, from a yard to five feet in height.

Not a few older varieties, such as the Cosford and others, come pretty true from seeds, and the majority of seedlings from good strains produce good varieties. The Nuts may be sown so soon as gathered, or stored in sand till February or March, then sown thinly in drills from two to three inches in depth. Many will come up the first year, and the remainder the second. Were the Nuts cracked, and the kernels only sown, they would vegetate sooner, but more of them would be consumed by vermin. Leave them two years in the seed-bed or row, then line them out in drills two feet or a yard apart, and from six to fifteen inches in the rows, and finally plant into garden, orchard, or coppice as they reach sufficient size.

Suckers may be said to be the natural mode of propagating Nuts and Filberts. Left alone all Nut plants spread out into a stool. The mode of growth is not unlike the Raspberry, with this great difference, the old canes do not die off. The plants left to themselves soon spread out from one to a dozen or more stems. Each of the latter as it springs forth from the root-stock is, so soon as formed, an independent plant. It has only to be carefully separated, and planted in its fruiting quarters, and it becomes a Nut-bearing and a sucker-making bush. Under good culture this stooling system is repressed in favour of single stems; but under any system there is generally a sufficiency of suckers to be found for propagation.

Purple, and other choice varieties, are often propagated by layering.

Planting.—The best soil is what is called a hazel loam. It should be from two to three feet deep, and rest on a dry bottom, such as rock, gravel, or sand. The Hazel-nut will grow on almost any soil, but annual crops of good quality are quite a different matter. To insure these a warm sunny site on the best soil, and skilful culture, are essential. The end of October, or early in November, is the best time to plant Nuts. The distance apart may vary from five to fifteen feet between the rows, and about half these distances from plant to plant, according to the quality of the variety, the nature of the soil and climate, and the mode of sub- or super-cropping adopted. In Kent, the great English Nut county, Hops, and sometimes Apples, are employed as a super-crop between Filberts planted in rows twenty feet apart. More frequently Nuts are sub-cropped with Gooseberries, Currants, Raspberries, and vegetables. There are other advantages besides cultural in the admixture of Nuts with other crops. The Nut blooms so early—the male blooms opening in winter, and the female ones so soon in the spring—that the crop is not seldom too severely thinned for profit, or wholly destroyed. In such cases it is a great source of satisfaction and profit to have some other produce to fall back upon. Where the entire ground is devoted to Nuts or Filberts, they are generally planted in rows nine or ten feet asunder, with five, seven, to nine feet between the stools. These distances afford room for the full development of the plants, and ultimately yield a maximum amount of produce from a minimum area of ground.

Pruning and Training.—The main point in training is to secure an upright stem from a foot to three feet in height. If the plants are too weakly when planted to form such a stem, they should be cut down to the ground-line, and one strong shoot encouraged. This at the winter pruning should be cut back to eighteen inches or a yard from the ground, and from this centre from five to seven shoots of almost equal strength should be trained out vase-fashion, in a similar manner to that recommended for Gooseberries. Should only two or three breaks be obtained from the centre stem, these should be shortened back next season within a few inches of their base to force the requisite number of shoots to form the future framework of the trees. In this way a sufficiency of forming and fruiting wood is furnished right back to the base of the bushes. Trained thus, each Filbert will have a clear stem, and enable the cultivator to get rid of the plague of suckers, as well as increase the fertility of the bushes. On each stem will be mounted a squat bush, pruned and trained very much after the manner of a Gooseberry, only, instead of hard-pruning the young wood back to the base, several inches should, as a rule, be left for Nut-bearing. The Nuts are chiefly borne on the lateral shoots, so that it is needful to stop the leading shoots in order to produce these in plenty.

The character of the Nut-blossom determines, to a great extent, the best time to prune it. The Hazel-nut has not only two very distinct sexes of flowers on the same plant, but these open at different times, and frequently most of the long male catkins have faded before the small, reddish, inconspicuous female blossoms expand. By pruning in January, as is often recommended, the chances are that there will not be sufficient pollen left to set the female blossoms. Hence the wisdom of not pruning till near the end of March. The pollen will then have done its work, and those branches that bear chiefly male catkins may be cut off. The female blossoms will also have become more conspicuous, and any barren branches may be cut out or shortened back to the Nuts, while the barren laterals may be pruned hard back to within half an inch of the leading branches.

Occasionally Filberts become so fertile that very few male catkins are produced. In these cases it is very important to collect the catkins from Wood-nuts, or from other bushes, and suspend them over and among the trees studded with female blossoms, in order to make sure of a crop. Some of the most successful Nut-growers gather part of the male catkins when in full flower, and save them till the female blooms get farther advanced, and then suspend them over, or distribute the pollen among them.

The pruning of Filberts is generally continued for the purpose of limiting the area and height of the trees, as well as the moulding of them into form, and the assisting of their fertility. In practice it is found that a height and breadth of from four to six feet are not only most convenient, but the most profitable, and it is astonishing what enormous quantities of Nuts may be gathered for many years from trees hardly exceeding these sizes.

Of course there are other modes of growing Nuts, in which the single stem system, and most of this pruning and training, are set aside. The Nuts are allowed to spread into stools with six or more branches rising from the roots, and these are permitted to run up and fruit. Large crops may be gathered in this way, and most of the labour involved in the scientific culture of the Filbert be avoided.

The General Cultivation of the Filbert.—This consists in sub-cropping the surface during

the earlier years of the plantation with Potatoes or other vegetables, keeping it clear of weeds, and manuring it after the plants have occupied the ground. The Kentish growers attach great importance to the use of refuse rags for manure. But farmyard or other manure is also well adapted for Filberts. It is found that the crop seldom reaches the same perfection on Grass as on arable land. This probably arises partly from its being colder, and likewise from the impoverishing effect of the Grass on the root-runs of the Nuts.

Gathering and Storing Nuts and Filberts.—So soon as the Nuts become brown, and separate readily from the husks, they are fit to eat. But for long sound keeping they should be what is called dead ripe before gathering. It is rather difficult to keep Filberts in the husks. Still, it may be done with more or less success by thoroughly drying the latter, either in the sun or with sulphur fumes, before packing into air-proof jars or pots. The latter, if not over-done, is best, as it removes all the moisture from the husks, partially bleahces them, and destroys the germs of the mould, or fungi, that mostly accelerates their decomposition. It is a mistake to add salt, or anything else, to Filberts. They keep far better without, packed closely, and stored in a fairly dry store-room. Nuts out of husks keep best packed in jars in a similar manner, closely covered over, and buried about a foot deep in dry soil. Thus stored, they retain their original sweetness and moisture for many months.

Diseases and Insects.—Properly cultivated the Filbert is not subject to any disease. Occasionally it may be met with in a jaundiced state, but this results from a wet bottom, unsuitable soil, or other errors of culture, rather than any fault of constitution. Caterpillars also infest Nuts at times, but these are accidental visitors rather than natural to the plants. Almost the only constitutional enemy is the Nut-weevil (*Balaninus nucum*), which plays sad havoc with the crops in some localities. All lovers of Nuts are more or less familiar with the grub. The weevil pierces the tender shell, and deposits a single egg early in the season. The maggot when hatched eats up the kernel, and proceeds to bore its way out. The Nuts thus pierced generally fall prematurely. The injury inflicted loosens their hold on the trees, and if the latter are sharply shaken early in August, nearly the whole of the maggoty Nuts will fall, and can be collected and burned.

Varieties.—Fortunately the finest cultivated sorts of Nuts and Filberts are not very numerous.

Atlas, or Downton—this is generally known as the Algerian Nut, C. Algieriensis; husks longer than the Nut, large kernel of excellent flavour

Lambert's Filbert (C. tubulosa)—very long husk, Nut very long and wide, one of the very best. There is a white variety of this equally as good as the type, which is one of the best Filberts in cultivation.

White Filbert.

Red Filbert.

Purple Filbert.

(These three are classed together, and are without doubt three of the very finest Filberts in cultivation.)

The Purple Filbert is largely grown at times as an ornamental shrub; its leaves and richly-coloured husks being quite as useful as the Purple Beech to contrast with the verdure of other plants. This Filbert is also most useful in forming a highly ornamental dish on the dinner table.

Frizzled Filbert — husk double the length of the Nut, late and fine.

Loddige's Barcelona—husk very large, almost double the length of the Nut, early, but rather small.

Merveille de Bollwyller—husk longer than Nut; large Nut, and kernel of excellent quality.

The Shah — strong resemblance to the Frizzled Filbert, deeply and roughly cut, excellent quality.

Great Cob (Prolific Cob)—one of the best Nuts, and most prolific bearer.

Cosford, or Thin-shelled—husk short, deeply cut, shell so thin as to be easily broken between finger and thumb, kernel sweet and large.

Duke of Edinburgh—rather a new Nut, raised and introduced, as were the next and several others, by Mr. Webb, of Calcot, near Reading, a specialist in Nut-culture; husk deeply and coarsely fringed, Nut large, shell thin, quality first-rate.

Daviana, or Duchess of Edinburgh—husk slightly longer than Nut, shell thin kernel large, of excellent flavour. Probably seedlings from the Cosford.

Eugénie is another enormously large fine Nut, of similar quality of shell, and excellent flavour.

Norwich Prolific—an excellent thin-shelled Nut, raised by the Messrs. Ewing, of Norwich; the Nuts, which are large and of squarish shape, are said to have the flavour of Almonds.

Pearson's Prolific—this is a Nut of quite a different quality, long, of dwarf habit, very prolific, the shell thick, with a full-sized kernel.

Red Barcelona, or St. Gresier—this is one of the finest-flavoured of all Nuts and grows in large clusters.

Bond Nut—very prolific, not a long keeper, grows in clusters, Nut oblong, shell thin, medium quality.

This list includes all the best Nuts in cultivation. But those with limited space hardly need to go beyond the White and Purple Filbert, the Cosford, and Cob, for a good supply throughout the year.

THE WALNUT.

There are several species of this well-known and useful genus, such as the Grey Walnut, or *Juglans cinerea*, the well-known Butter-nut; and the Black Walnut, or *J. nigra*, the large nuts of which are too oily and strong for our taste. Both of these form useful ornamental trees, but are not grown for their nuts in our climate. The latter are the products of the species *regia*, of which there are numerous varieties, differing widely in foliage, as well as the size, form, thickness of shells, and quality of their nuts. Some of these varieties, such as *J. r. elongata*, have long been so popular for the size and quality of their very long nuts as to be almost ranked as distinct species. Another, much valued for its deeply-cut leaves, known as the *J. r. laciniata*, has nuts of very fair quality as well. The so-called

J. r. maxima has shells of enormous size and thickness, thus reducing the kernel to disappointing dimensions. The shells of this sort are often used as jewel-cases, &c., but the quality of the nuts is far inferior to the common sort.

J. tenera, or Late, hardly opens its flowers, nor develops its leafage, until the end of June, thus enabling it the better to escape spring frosts. The nuts are well filled, and of medium size, but do not keep so well as some of the others.

The Highflyer is an early variety of the highest quality, that is generally grown in East Anglia in preference to all others.

The Yorkshire is a fine large nut that fills well, and with a larger kernel than the so-called *maxima*.

The Dwarf Prolific fruits freely from five to eight feet high, the nuts are also of good size and excellent flavour.

The Thin-shelled is perhaps, on the whole, the very best of all Walnuts; shell thin and tender, and the kernels of the highest flavour. Of the so-called common Walnut there are also many varieties, varying very much in quality, as most of them are raised from seeds, and these come more or less true. Fortunately the Dwarf Prolific and the Late Walnut are reproduced true from seeds.

These, and other favourite strains, can be propagated by grafting and budding: for the modes of thus reproducing Walnuts see general article on PROPAGATION. Practically few growers attempt to propagate Walnuts unless by raising them from seeds. Sow the seeds either in the autumn or spring, in drills three inches deep, and eighteen inches apart, placing the nuts from three to six inches asunder. The nuts will soon spring up, and the seedlings must be kept clear of weeds throughout the summer. Leave them a second year in the seed-beds, then line them out in rows two feet or a yard apart, and nine inches from plant to plant. Here they remain till fit to plant out in their permanent quarters, which will hardly be till they are five or six years old.

Walnuts are mostly trained to single stems from three to five feet in height, and allowed to assume the form of round-headed trees. Should an excess of branches or much irregularity of growth be produced, these may be thinned out, or moulded into shape; but, unless in the case of the Dwarf Prolific, which may be fruited when the size of a Filbert, very little pruning or training is attempted. Fertility, however, may be greatly hastened as well as heightened, by subjecting the more choice strains of Walnuts to annual liftings and root-prunings from the first. Planted where it is to grow into fruit or timber, the common Walnut will seldom fruit till twelve or more years old; but sown in seed-beds, and annually lined out, worked plants, or those fixed varieties that come true from seeds, will fruit much earlier.

Planting.—The Walnut is mostly planted singly or in lines and groups, either in the park or the orchard. It forms an ornamental tree, with male and female flowers on the same plant, often closely intermixed. Being one of our latest trees to leaf and bloom, it escapes spring frosts far better than the Filbert and Hazel-nut. The tree being exceptionally long-lived, and fruiting more freely as it advances in age, it should have a good depth of suitable soil. The Walnut thrives best on calcareous loams resting on a dry bottom, and, if such can be had a yard or more in depth, they will prove admirable for its permanent cultivation. The trees should not be closer than from twenty to eighty feet, fifty being a very good average for ordinary soils. Groups may be planted having larger spaces between the groups. If planted in parks, spaces from six to seven feet in diameter, and three deep, should be thoroughly prepared by trenching, and the replacement of indifferent soil with the best available. Trees from six to eight feet high are mostly planted in grazing meadows, made secure to stakes, and protected from stock with guards. It is found that the trees make much more progress if the surface of the roots is kept fallow for several years after planting.

General Cultivation.—Few trees need so little, and get less. The natural habit is all that can be desired for fertility or ornament. If grafted or budded plants are employed, of course it will be needful to see that the wildings do not overrun the cultivated varieties from suckers or shoots from below the union. It is a mistake to head down the trees at planting; unless too large, they should be left intact. This will throw them into fruiting earlier, and make them more fruitful, checking growth. Another caution should be given. A popular error prevails that the more Walnut-trees are beaten—that is, broken about in the gathering—the more fruitful they become. On the contrary, the fewer leaves and branches broken in gathering the crops, the better for the quality and bulk of all succeeding crops. When, after many years of fruitfulness, Walnuts begin to hoist signs of weakness, the trees may be rejuvenated by removing the worn-out soil down to their roots, and replacing it with a rich compost of two-thirds meadow-loam, and one of well-decomposed farmyard manure. Should the roots be found in a dry state, a thorough soaking of weak manure-water, or sewage, applied before or during the process, will powerfully assist them.

The Crop.—Well-established trees are apt to indulge in the dangerous luxury of over-cropping. Every bough will be furnished and weighted down with nuts. This is all very well for the current year, but the penalty, as a rule, is no more nuts for two or three to come. Now, it is found that the Walnut draws little strength out of the trees until their soft shells begin to harden. Just before this stage is reached, and when a stout needle or knife will pass freely through them, the proper stage for pickling is reached. Proceed, therefore, to thin the crop down to reasonable dimensions, and pickle all the thinnings.

So soon as the nuts become sufficiently ripe to gather they will begin to fall, and should no thieves fall upon them, the whole crop would be as well to remain till it fell. The process is, however, slow and dilatory, and hence the nuts are helped down by shakings and thrashings with sticks, &c. They are then placed in layers from four to six inches in thickness, until the shells enter the first stages of decomposition. The moment this happens they should be removed before they have rotted sufficiently to stain the nuts black. Leave the nuts a day or two to dry, then pack in jars of sand, or in empty jars or flower-pots, and sprinkle them with a little salt in the process of filling. Store in a cool place, or bury in the ground as recommended for Filberts and Nuts. Before use rub or brush quite clean, and the nuts if properly husked and stored will appear at table of a bright, cleanly, nut-brown colour, free from fungoid taint and all impurities.

The shells used to be in request for dyeing, and are also converted into excellent ketchup.

Diseases, Insects.—The Walnut on good soil enjoys complete immunity from disease. Two or more caterpillars, however, prey rather heavily on the leaves in some localities. These are the caterpillars of the wood-leopard and the goat-moth. The fruit are also devoured by various birds; rodents and tomtits make rapid havoc among the slender-shelled sorts, and no Walnut is shell-proof against rooks and jays. These will clear a large tree in a few hours if not shot or scared away. Squirrels, rats, mice, are also very destructive. The two latter, however, must wait till they fall, and squirrels are not so keen on Walnuts as on Filberts.

It is scarcely possible to net out rooks, they will eat their way through the strongest and best when Walnuts tempt them through. And those that would enjoy their nuts must subdue their enemies, and care for their trees.

THE SWEET OR SPANISH CHESTNUT.

Our chapter on nuts would hardly be complete were this, in many respects the most valuable of them all, excluded. It cannot, however, be said of this as of the Filbert that it may be grown as well in England as in Spain or Italy, for our finest samples are small and poor, contrasted with those huge nuts almost as large as Walnut shells and all that are grown under sunnier climes. Unlike our other nuts, the Sweet Chestnut needs cooking before eating. The simplest mode is that of roasting them in an oven, or hot wood-ashes. They are equally good boiled. Either way they are mostly served for dessert in a thick napkin to keep them hot. On the Continent roast or boiled Chestnuts generally form a separate course at dinner. They are also largely used for soup; stewed in soup, cream, or gravy, or with meat; and for stuffing fowls, conversion into pies, puddings, fritters, cakes, porridge, and bread. In fact, Sweet Chestnuts are less of a luxury on the Continent than a cheap and substantial article of food. But the crop is too precarious in this country to assume anything of national importance as an article of diet, though it may be enjoyed as a pleasing luxury throughout the larger portion of the Eastern and Southern counties. The tree is highly ornamental, and fairly valuable for timber. It thrives well throughout the greater part of the kingdom, and is one of the most rapid-growing trees we possess, reaching a height of fifty feet and a diameter of from two to four feet in fifty years. Hence it is valuable for game-coppice, though its timber is not very valuable. But few woods grow more rapidly into money or cover as coppice. Hence the Chestnuts, when they ripen, come as an extra over and above the other uses of the trees.

Like some other trees, notably the Walnut, under favourable conditions, the older the trees the more and finer the nuts. Those who have seen the crop of Sweet Chestnuts on such monarchs as are to be found at the Chantry, and Shrubland, near Ipswich, and many other places, could no longer refuse to include the Spanish Chestnut among British nuts. Not a few of such nuts approximate very closely in size, while they are equally as sweet as those of Spain or Italy.

Varieties.—There are a great many cultivated varieties on the Continent—over fifty, so it is said. Only a very few have been grown in England. Devonshire Prolific is most fertile, and the most likely to ripen a crop of any that have been tried. Downton or Knight's Prolific is hardly such a free-fruiting variety as the above. There is also a dwarf variety or species named *pumila*, which fruits in less space.

Possibly, as more attention is bestowed on the culture of these nuts in England, more of the French and Spanish favourite varieties, such as

Marron, Franc du Limousin, and La Chataigne Escalade, will be tried under such favourable conditions as will assure success.

Propagation.—This is by budding, grafting, and from seeds—the former for the perpetuation of choice fruiting strains, and the latter for raising trees for picturesque effect, coppices, &c. Some of the finer and larger established strains also come true from seeds. Sweet Chestnuts are mostly raised from American nuts, as those grown at home are considered too small, and the majority of French or Spanish ones have had their germs destroyed by being kiln-dried to preserve the nuts in good edible form. Good sound English Sweet Chestnuts may, however, be sown, and will produce strong, good plants.

To avoid destruction from vermin, sow the nuts in February or March, in the same mode and distance as recommended for Walnuts. The preliminary or nursery treatment may also be of the same character. So soon as they have been nursed up into trees with stems about two inches through, they may be planted in their permanent quarters.

From twenty-five to thirty feet apart is sufficient space for Sweet Chestnuts, as if annually or biennially root-pruned during the first few years, they will fruit more, and grow far less freely.

Light, sandy soils, or very light loams resting on dry subsoils, are the best for Sweet Chestnuts. They will not thrive long on calcareous or heavy soils, nor where stagnant water reaches the roots. The site should be warm and sunny, sloping to the south if possible. Groups, or single trees, in sheltered sunny orchards, on southern slopes in parks, in warm nooks and corners, or the warm sides of orchards, are the most likely to ripen Sweet Chestnuts. Sandy peats, where they prevail, are at once hot and favourable for maturing the fruit.

Pruning and Training. (See Walnuts.)

General Cultivation.—This is next to nil. Instead of fostering, the Sweet Chestnut needs starving to heighten its fertility. It is less that our climate is too cold, than that the major portion of our soil is too rich to mature the fruit. Throughout the greater portion of Italy the Sweet Chestnut is grown on soils too poor to grow Corn, and too dry to grow Grass. With a slight preparation it would probably prove a fairly profitable crop on many portions of our moorlands and heaths.

Gathering, Drying, and Storing the Nuts.—As the nuts ripen the burrs open, and the nuts fall to the ground either with or without the burrs. The trees may also be shaken, or the nuts gently tapped off with long, flexible boughs, so as not to injure their branches, for the fruit-buds for next year are mostly formed on the extremities of the young shoots of the current season. Carefully dry the nuts in the sun, or over slightly warmed flues, or in a gentle oven, so as to drive out all extraneous moisture. Most foreign nuts are so severely kiln or otherwise fire or sun dried as to destroy their vitality, these processes being continued for a week or more, the drying being accomplished slowly. And if so much care is needed in the drying of foreign nuts, even more should be exercised in regard to home-grown ones, as the latter of necessity contain a larger percentage of moisture. After thoroughly drying, store the Chestnuts away in air-tight jars or boxes till wanted for use. The very dark colour of many Spanish nuts doubtless arises from the severe roasting process to which they were subjected in drying, which prevents them from contracting a musty flavour afterwards.

Though the Sweet Chestnut is a native of Asia Minor, it thrives so well in our climate as to enjoy almost an entire immunity alike from insects and disease.

THE MELON.

(*Cucumis melo.*)

By William Earley.

THE Melon is, as the technical name above given explains, intimately related to the Cucumber. In its indigenous state it is a herbaceous succulent, of a trailing or climbing habit, and is one of the most enduring amongst tropical fruits, persistently retaining its hold in various arid parts of the globe—such as Bokhara and the plains of Ispahan—where drought and aridity have driven other luscious and valuable kinds out of existence. The merits of Melons vary; for instance, the coarser kind of Cantaloupe, famed for ages around Rome, the "Water" and "Musk" Melons of tropical Africa, &c., are eaten in the early part of the day as cool refreshers rather than from any aromatic or fruit-like flavour and merit which they possess.

By the more modern and more perfect systems of heating, and by the general practice of raising Melon fruits off the ground on to trellises near to the glass, in lean-to or span-roofed pits or houses, the fruits can be more readily exposed to tropical conditions, and ripened into higher perfection of flesh and flavour.

Grown in frames or under glass structures generally, the highly succulent and green leaves may suggest to many that the Melon is somewhat an aquatic or shade-loving plant. The facts are quite the reverse, however, for whilst leaf and root develop

rapidly when young in a high temperature and a moist atmosphere, they require subsequently intense light and very great heat to perfect the maturity of the fruit.

Soil.—The soil best suited is a yellow loam, and somewhat consistent, though not too adhesive. The object should be to give the roots such a rich holding loam as will engender abundant fibres, and retain within its bulk a moderate latent moisture constantly without the need of too frequent waterings. The soil should be made very firm by being beaten or trodden down all around each plant. Furthermore, where great success, as regards size of fruits, number, and highly-developed or finished flavour, is to be secured, a goodly depth of such soil is imperative. Cultivators err far more frequently in having too shallow mounds of such soil beneath their plants wherein the roots can freely and fully extend and ramify, than from most other causes. The too common custom is to place mounds or ridges, whereon such plants are to be grown, only eighteen inches or so from base to apex. Whether grown upon hot-beds or within span-roofed structures, from two and a half to three feet depth of soil is, therefore, very essential, and it will be well for all who construct pits within such structures in the future to provide for such goodly depth of root-soil.

As regards the addition of manure to the soil, it is never desirable in connection with hot-beds, or whenever grown upon fermenting materials whereon the roots feed as suggested, to the future injury of the fruit crop. When grown, however, over artificial and hence dry heat, whether this consist of pipes or flues, a small quantity of such as is thoroughly decayed may with advantage be incorporated with the soil.

Atmospheric and Bottom Heat.—The latter should not exceed, indeed it should always be maintained as near to 75° as possible. Were it not for this degree of bottom heat, the Melon might be grown in the open air in our climate in warm seasons. By burying considerable quantities of fermenting materials in the soil, the hardier varieties, such as Little Heath, have been successfully ripened in favourable localities. Without such aids its successful culture in the open air cannot be assured beyond the forty-third parallel of latitude. Under an able system of artificial culture, atmospheric warmth ranges from 80° or 85° up to 100°.

Any excess of moisture, and a somewhat confined atmosphere during early forcing, engender mildew upon the leaves and canker at the "collar" of the plant—that is, the portion where stem and root meet. It is safe practice never to water the collar, owing to the fact that moisture in immediate contact with it aggravates the evil of canker. Neither should the collar be over-shaded, as full sunshine seems to be one of the best antidotes to canker. Every care should be taken of this most vulnerable part of the plant, as injury here leads to the loss of the crop just as the fruit are approaching maturity.

Sowing. — Seed-sowing for artificial culture should not, under the most favourable circumstances, be undertaken before the month of January in each year, nor later than the month of April for the late autumn crop. The time which intervenes between the date of seed-sowing and the ripening of the fruit is upon an average four months. Well-ripened seeds should always be employed, and their merit is said to be greatly enhanced when kept until two or three years old, as they are considered better adapted for fruit-bearing when so treated.

Whether early or late crops are to be grown, every preparation must be made to be ready for the young plants in due time. These must be commenced, as regards frame or pit culture, which is dependent on fermentive materials, before the seeds are sown. Sufficient stable manure, or fallen tree-leaves—they do well mixed together—must be collected and placed in a light conical heap to ferment, which will require turning over twice at least subsequently to insure dispersion of steam and all obnoxious gases, &c., it may contain, when the bed must be made precisely as advised for Cucumbers.

Seeds should be sown about three weeks or one month before this or any other structure will be ready to receive the young plants. Procure free fibrous loam and well-decayed manure, break up very fine, filling a 48-sized pot, or 32-sized, according to the number of plants required, sow the seeds thinly, and cover them with about their own thickness of soil. From six to twelve seeds, according to the size of pot chosen, may be sown in each, and plunge the pot in a warmth of 80° to 85°. When the seeds have germinated, and show the third or rough leaf, procure more soil similar to the last, and 60-sized pots, to pot them off into. With care, not to in anywise injure the young roots, remove them from the seed-pot, and having three-parts filled the small pots with the soil, place two plants in each pot at two opposite sides, filling the pots well up with the compost, and pressing it down somewhat firmly. Plunge the pots into bottom heat, and on the following day give them a root-watering. Immediately the second or third rough leaf is perceived to be forming, and the point of a growing shoot observed, pinch the latter off beyond such leaves. Water as needed, and shortly the primary leaves will be seen to develop shape and size, and at their axils young

buds maturing into shoots will form. At this stage the plants may be transposed to their permanent beds, in which they are to grow and mature their crops.

Cultivation.—Whether Melon-house, pit, or frame be employed, it will be necessary to form a conical mound of soil for each, as high or near to the glass as it is intended it should grow. Such a mound may be curtailed as much as possible as regards circumference of its base, providing it be maintained at proper height. In such a position the young plant will make a rapid growth, pushing forth roots freely through the sides. When this is observed a quantity of soil, consisting of double the amount of the first mound, must be placed around it, up near to the collar of the plant, but not in such manner as to be in contact with it. Make the whole as firm as possible, without in any way injuring the roots. The advancing roots will quickly show through the mound again, especially midway from its apex. Then will it be necessary to give the final moulding up, when sufficient soil should be placed around, in whatever position the roots grow, to make its surface level, always keeping the base of each plant in contact with the soil an inch or two above such mean level.

Some, however, prefer to place all the necessary soil into mound-shape at first, so as to secure the proper height for the plants, adding also soil to make the whole bed level as described. Moulding by degrees is resorted to where limited heat only is at command, and which must not be checked by excess of weight, nor, as in the case of fermenting materials, be unduly covered to shut down the rising heat, until summer is so far advanced as to afford enlarged supplies of solar heat.

The earlier the date at which operations are commenced, so much the more artificial heat and other needful attentions will be required. Nor, excepting where constant supplies of all fruit possible in season are required, is the gain equal to the outlay in commencing too early in the year. On this consideration February will be a far more advantageous month than the previous one to commence operations.

From the moment the young plants are finally planted out, constant attention will be needed in view of maintaining atmospheric warmth of from 80° to 85°, and root-warmth as near to 75° as possible. Atmospheric moisture, conjointly with a liberal supply of fresh air, so admitted as to cause no cold draughts to travel over the plants, must be studiously accorded also.

To secure this a uniform rule of duties must be outlined and attended to. A solitary neglect of such will oftentimes destroy at once all hope of ultimate success. Such rules, simply described, are as follows:—In the early morning all kinds of protective coverings, if they exist, must be taken off and packed aside neatly. The slight amount of fresh air given in the evening preceding must be removed, so that the temperature, which is permitted to fall five or eight degrees during the night-time, rises again with the growing or increasing light of day to its normal level. Immediately this is reached, during dull weather give a little air again near the apices of the sashes, and on full sunshine mornings give this air as soon as the thermometer rises to 80°. Again about an hour afterwards increase the air, and again increase or decrease it according to the action of sun or wind and its influence upon the internal atmosphere or thermometer. A temperature of 90°, or even more, will do no harm with a free circulation of air.

Shading is not desirable in any form. Occasionally, however, following a dull or sunless period, abrupt and full sunshine, especially if accompanied by a searching easterly wind, will cause the leaves of young plants to flag or droop. This should be prevented by a slight shading for an hour on each side of noon.

Between the hours of one and three o'clock, according to the date of the spring or summer, tepid water should be given in moderate quantity. This is generally done by placing full water-pots in the sun in the early part of the day, so as to be handy for the purpose of sprinkling or watering in the afternoon. Where this cannot be done, add a certain amount of hot water to the bulk of cold.

At the hours named, and during bright weather, the internal parts of the glass structure or frame should be sprinkled over, and also the foliage of the plants, taking great care always, as previously suggested, not to moisten the base of the plant at the ground-line. At the early part of the season this operation must be done studiously, during dull days not at all, and with increasing freedom accordingly as sunshine exists or not. The desire should be to accord atmospheric moisture in connection with light and heat; in other words, tropical weather in the rainy season. One very important fact connected with such atmospheric moisture must not be overlooked, however, in the early spring, when a prolonged sunless period exists. It is that the young plants, which are swathed in condensed moisture arising from internal steam, must, if possible, be dried once during each day. This is often so difficult of attainment in pits or frames heated by fermenting materials alone, that many growers place jars or bottles filled with hot water around the plants to aid the process. Such an explanation will show when it is proper to give artificial overhead sprinklings and when to withhold them. In glass structures

heated by pipes or flues, this difficulty does not occur. Here, therefore, such sprinklings are absolutely needful to insure atmospheric moisture, counteract the dry heat prevailing, and act as a deterrent of insect pests. Immediately such sprinklings are made, close all air apertures. During the months of January and February this should be done at one o'clock, making it later by degrees as the sun rises and gains power. When shut up close as advised, it is intended that the sun-heat shall cause the internal warmth to rise, at which times, all spaces for the admission of air being tightly closed, the thermometer may run up to 95°, or about Midsummer, when the plants are matured and hardy, to 100° Fahrenheit.

As growth advances, plants attain to robustness, and frame or trellis-work becomes tolerably well filled with healthy foliage, root-waterings should be given about twice a week. These must be so thorough as to reach all roots requiring them, finishing off with an over-head sousing. At such times it is desirable to "shut up" half an hour earlier, as the process of root-watering cools the soil, and the very fact of opening the sashes in the case of pits or frames also cools the air. When crops are set and swelling, weak manure-water should be given at these periodical waterings alternately. Root-waterings must cease from the time fruits are netted. Occasional overhead sprinklings will be necessary, however, to maintain the foliage fresh and active, and, above all, to deter the formation of insect pests, which, in the form of minute red spiders, these plants are extremely liable to.

Training and Pruning.—Training or pruning (thinning) the plants is an all-important part of culture, and accordingly as this is done with skill, so will ultimate success or the reverse follow. When the plants make real, rapid progress, and the vines become a foot or two long, they habitually form a few strong leaves somewhat thickly together. These should be slightly thinned, so that one leaf does not shade another, and the leaves which shade the base of the plants should be removed altogether. Whenever leaves are removed it is desirable to cut them off quite close to their base, and the vines whence they emanate, with a sharp-edged knife. Some beginners, acting with much caution, simply twist off the upper leafy part, leaving the stalks standing—a practice not to be commended.

The process of pinching out the points of the shoots upon the very young plants should cause each plant to produce about four duplicate shoots in lieu of the one stopped. Where less have formed, or two plants have not been placed upon each mound to make up for the deficiency, it will be necessary to again "stop" the plant to secure sufficient shoots to furnish pits or frames. With at least four main shoots secured to each plant, the simple process of training is to induce such four main shoots to grow away direct from the plant, at equal distances apart, towards the four furthermost corners of the space each plant, or two plants together, have to cover; all secondary shoots are to fill out spaces between these main ones. When these main shoots are so far advanced as to show that, when stopped or their points are pinched back, they cannot quite reach each its corner, this must be done. This stopping will cause each main shoot to form and push forth laterals. Train these on each side of each vine into all vacant spaces. It will be observed that each lateral will possess a female, or fruit-producing flower, at the axil of the first or second leaf. So soon as these are observed, stop these laterals also immediately beyond the next leaf formed beyond such as has the embryo fruit. As this process of stopping the laterals will, for the time being, check shoot-formation and progress, the strength of the roots will be thrown into the leaves, and these will grow into finely-developed size; so much so that the crop of leaves will quickly become too thick, and require thinning or reducing in numbers, which should be done somewhat by anticipation. Remove a few of the older leaves from the main vines only, but never remove one such from the vine or that joint of any whence young or lateral shoots proceed. All care must from this time be devoted to maintaining such leaves as then remain in fresh and full health. The leaves may not inappropriately be called the fruit in embryo, for without such in perfect form, health, and vigour, it is impossible to secure finely-developed and flavoured Melons.

As regards the training of such as are grown to trellis-work under span-roofed and other structures, the desirable practice is to grow one stem only at first. This is secured by cutting away clean from their base, in the same manner as advised for leaf-pruning, all the youngest or weakest shoots, and growing on the plants with one stem each only. Such plants are then trained up until they reach the roof of the structure. They are there stopped if a short span exists, and a limited number of plants only. With numerous plants the main stem is carried on up to the limit of the roof, and is there stopped; the laterals from which produce the fruit. Subsequent attention is much the same as that already described.

In a short time, following this last process of stopping the laterals, especially if such attentions in the matter of heat, water, and air have been accorded them as previously suggested, the female blossoms will expand. It is customary to fertilise each female blossom when fully expanded. The practice is a desirable one, especially when early crops are grown. The process is simple. Choose a male blossom fully

expanded, and with a dry centre. These are readily discernible and more abundant than the female blossoms, having no embryo fruits attached. Remove the floral envelopes or corolla therefrom, and insert the point or pollen boxes into the centre of the female blossom, so fixing it that it remains there. By treating each female blossom thus, fertilisation will be all but certain. During the time that the female flowers expand, it is desirable to keep the inside of the structure or frame dry, which also assists this process.

Fruiting.—In a few days the young fruits will be seen to commence swelling, and it is an important feature to treat the plants so that many female blooms will expand together, "set" nearly together, and "swell off" in unison. Should this not be secured, the risk will be run of possessing only one or two fruits upon each plant, it being found in practice almost impossible to set other fruit after one or more have taken the lead.

From the moment these young fruits commence to swell, return to the full sprinklings overhead and root-waterings as necessary, and assist the plants in maintaining the utmost health and vigour. When the young fruits, frame or pit-grown, are about the size of a pigeon's egg, place a piece of slate under each to neutralise the damp effects of the ground, or, as is often done, invert a small flower-pot near, upon which to rest each.

Pruning or thinning out branches and leaves, stopping the points of young shoots, &c., are periodical attentions needing close study. The object in view is to maintain as good a crop of finely-developed leaves as possible without undue crowding, as upon this fact rests all further success. The better plan is to fix a certain day weekly upon which to attend to this matter. The proper time of day to do this, especially in connnection with frame or pit-grown Melons, is immediately before the habitual afternoon sprinkling and shutting up. Remove the sashes bodily. Pinch back all sub-lateral shoots beyond the second leaf-forming. Remove every symptom of decayed leaf or growth, including any clusters of male flowers, so arranging the vines that all leaves have equal space and light. Take every possible care of every leaf having a fruit at its axil, the loss of which will either limit the size or quality of such fruit, and in frames sometimes cause its loss by a decay of the parts. The collar of the plant must likewise be carefully treated, always keeping it dry, and should canker form upon it, place a little fresh-slaked lime around it.

When it is observed that the fruits are three-parts netted, or in the case of such as do not net, the rind shows symptoms of maturing, withhold water from the roots entirely; and as the ripening proceeds, give slightly less air during the day, maintaining this more limited quantity for half an hour later during the afternoon. The foliage will at such a stage be well able, being well matured and hardened, to support the additional heat caused by the earlier closing. Slight sprinklings must be given at the later date, but they may be directed around the inner side of the frame or structure, and just over the leaves rather than upon the soil; their object being to cause atmospheric moisture only for the aid of the leaves, and to deter the formation of red spider and other insect pests. At such a stage give also a slight additional quantity of night air, removing it betimes in the morning, so as to insure a return to the maximum warmth necessary at the earliest possible moment.

When trellis-grown fruits which hang down attain to about the size of a cricket-ball, sling them by the aid of cross-strands of matting, or support with wooden cradles. It is not desirable to remove the whole of the strain from the vines, but to neutralise it only. This until they approach the ripening stage, when their whole weight should be borne by the artificial supports.

The general colour of the fruits, and a slight cracking around the stem, show when fruits are ripening, as also does the aroma given forth. It is desirable to cut them off the vines with a portion of stalk attached, removing the leaf attached, before they become too ripe and are likely in natural process to remove themselves from its hold. By cutting the fruit before this occurs, and placing them in a cool airy place, the flavour is enhanced.

It is a too common error to keep Melon fruits too long before using them. They are nearly perfect when the stalks show a disposition to part from the fruits, and should not be kept more than two days after this occurs. It is better to cut them somewhat prematurely, as imported Melons are cut, and to store them until they emit a fragrant smell, than permit them to fully ripen upon the plants, and not to use them whilst good.

Varieties.—The following are a selection of excellent varieties of the Melon, from among numerous sorts retained in the usual lists. *Green-fleshed* (along with which white-fleshed varieties are classed):—Goodwood, Best of All, Bailey's Green-flesh, Carter's Emerald, Golden Queen, Hardwicke Hybrid, Beechwood, Dell's Hybrid Green-flesh, Eastnor Castle Greenflesh, Earl of Beaconsfield, Gilbert's Greenflesh, Benham Park, Queen Emma, Netted Victory, William Tillery, Dickson's Exquisite, and Horticultural Prize. *Scarlet-fleshed*:—Blenheim Orange, Cox's Golden Gem, Hero of Bath, Hero of Lockinge, Little Heath, Read's Scarlet-flesh, Scarlet Gem,

Scarlet Premier, and St. Blaise. Queen Anne's Pocket Melon is one of the most minute in form, free-bearing, and prettily netted, and makes a pretty dish, while Little Heath is one of the hardiest, and most suitable for cold-frame or open-air culture. The New Green Climbing, one of the greatest novelties; and the Citron Melon, a somewhat hardy variety suitable for preserving or similar conserves, are also worthy of a trial.

MELON-GROWING BY EXPRESS.

By D. T. Fish.

Each seed should be sown in a single pot or on a separate piece of turf, or in a bed of rich soil or manure, in which the seeds should germinate quickly and the roots ramify rapidly. So soon as they have formed one proper, that is, a rough leaf, the plants should be moved bodily, with every rootlet intact, to their fruiting quarters, and watered home with water at a temperature of 90° or 100°. Put a stake to each plant to hold it firmly in position, and in planting place the soil firmly round the lower part of the stem, not, however, burying the collar of the plant deeper than it was when it burst the seed and raised itself out of the covering earth. Neither is the plant to be stopped at this stage. It is these buryings-up of the stems of Melons, and the early stoppings of the leading shoots so generally practised, that render the collars of Melon plants so extremely liable to canker and fog off suddenly, as already pointed out in the article on general Melon culture.

One of the essentials of a proper condition is that they shall be grown in good loam, pure and simple. Manure in the soil is, as a rule, too stimulating and transient in its effects for express culture. Fibry loam of a somewhat tenacious character, intermixed with some calcareous matters, such as old mortar and lime rubbish, is the best material for encouraging a profuse ramification of roots. A foot of this laid over a few inches of drainage to start with is sufficient.

Method of Planting.—In planting keep the collars of the plants well up above the surrounding level; let them stand, in fact, on small mounds, and in all cases where the base is one of fermenting material, one or more drain-pipes, a yard or so in length, of four or six inches bore, a block of wood or stone, or a base of brick should be brought up from the base of the house or pit to receive the soil for the plants. This precaution will keep the stem of the Melon the same distance from the glass during the whole period from the start to the finish. It is impossible to over-estimate the importance of this. In hundreds of cases what is called canker at the collar is simply the result of the extreme tension put upon the plant through the root of the Melon sinking away from the root-trellis, and not seldom collar or stem snaps just when the crop is half finished. The old system of growing Melons on the soil of dung-beds had this merit, that the plants and the elastic bed fell together, and the modern dangers of root-drawing or stem-snapping were wholly avoided.

Fleet root-runs are also best for the express culture of Melons, as these afford special facilities for the enlarging of the food supply piecemeal as wanted.

Successive Top Dressings.—With heat lavishly applied, and the atmosphere in a state of semi-saturation, root as well as top growth will be exceedingly active. The roots will burst through the soil and root upwards so rapidly as to cover the surface almost as white as a sheet once a week or oftener. So soon as this happens a thin covering of loam should be applied and pressed firmly down on the roots with the hand or a small mallet. These frequent dressings not only act as powerful stimulants to the roots, but feed them with ever-new and sweet material as wanted. The freshness of the food is one of its greatest merits in the express culture of Melons. Root-runs thus formed tentatively do not get worn out or exhausted.

Liquid Manure.—The surface feeding also keeps the roots near to the surface, where they can readily be provided with fresh food, liquid or solid. Liquid manure is, in fact, one of the chief foods of Melons under the express system of culture. The soil becomes more of a mere receptacle for the roots, as the latter get so numerous as to fill to repletion every clod and cranny of it. So long as these are sufficiently strong and numerous, nothing can be more simple than providing them with food. The best food for Melons is a warm draught of soot-water or a half-and-half brew of soot and cow or sheep manure. This, of about the colour of porter, is unrivalled as a stimulant for Melons in full swelling. It should be freely used at a temperature of from 90° to 100°. During the earlier stages of growth little or no manure-water should be used. If overstimulated before the fruits are set, there may be some difficulty in insuring a crop under express culture. But so soon as a full crop is set the pace cannot well be too fast, and for several weeks afterwards it is hardly an exaggeration to say that one can see the fruit grow.

Burying the Young Fruit.—Where Melons are grown on dung-beds by express, the speed may be quickened immensely at first by burying the young fruit in the warm soil so soon as it begins to swell. The uniform heat and genial moisture

forward growth with leaps and bounds, and if the fruits are allowed to uncover themselves gradually, no evil comes of enshrouding them for a week or so at first in temporary darkness.

But this method of burying the fruit is a mere accident in express culture, and by no means essential to it.

Stopping.—Assuming that the Melons are grown on trellises, they should be allowed to reach halfway up the trellis or more before they are stopped. After this stopping, the plants, full of vigour and of growth, will break into several or many shoots. From three to five will prove sufficient for a crop. These should be chosen of as nearly a uniform strength as possible, and all others rubbed off. These side or lateral shoots form the ones on which the fruit will show. When this happens the instructions given by Mr. Earley cannot be bettered for the sure setting of a crop.

Few Fruits to a Plant.—In express culture, many plants with few fruits are to be preferred to few plants and many fruits. The latter is always somewhat risky practice in Melon culture, from the peculiar power that even one Melon on a plant has of monopolising all the supplies, and so starving off all the other fruit. The number may range from one to five fruits to a plant. There is something to be said even for the one plant one fruit system. Three Melons to a plant, however, is an excellent medium for express culture. The plants may be placed at any desired distance, from nine inches to thirty apart. Melon-seeds are cheap and plentiful, and the plants themselves of no intrinsic value. Hence time may be husbanded, and the chances of a crop greatly multiplied, by rather close planting. With an average of three or five Melons per plant a maximum weight may be cut from any given area, for the size of Melons and their weight are largely determined by the number of fruit per plant.

Until the Melons have reached full size, the cultivator may push them on at the highest possible rate of speed. Provided that they are grown near to the glass, that the latter is clean, and that they are not grown too early in the season—that is, not till towards the end of February or later, when the sun's light is becoming powerful—there is no fear of the speed unduly weakening the plants. More care will be needful in the removal of superfluous growths under express culture. The shoots should be stopped a joint or two beyond the fruit, and all laterals and leaves vigorously suppressed, beyond what can find room while fully exposed to the light.

Second Crops.—The stems are, however, of so much importance in this mode of culture that all the leaves should be left intact upon them, and every care be taken to preserve these primary leaves from injury. These impart unusual size and vigour to the stems, and not seldom keep them and the root-stocks in such vigour as to yield a third crop of fruit. And all this has been done within less than nine months from the time of sowing. But though several successive crops of Melons from the same plants in an incredibly short period of time is one of the indirect advantages of the express culture of Melons, it is by no means essential to the system. The plants may be destroyed after the first crop, and if good strong plants are ready to take their places but little time will be lost. But as the system develops such enormous root-force and vigour of stem, it is well to utilise these in the production of a second or third crop. This is the more important inasmuch as a second crop from the same plants can generally be produced and finished in far less time than the first.

Quality.—As the crop nears maturity, the atmosphere should be kept drier, and more air given. Up to this point little or no air may be needed. A close and semi-saturated atmosphere is the most favourable to the rapid swelling of the fruit. The roots should also be kept moist. The plants should never be allowed to flag from the start to the finish, nor should the roots be allowed to lack water during the finishing of the Melons. It is a vital mistake to force maturity through dryness at the root. The air may be dried as much as is consistent with the maintenance of the Melon foliage clean and green. But the transition from semi-saturation to partial aridity must be gradual, and not carried too far.

Cutting.—Fortunately Melons need not be quite finished on the plants. Soon after the fruit changes colour, and the stem begins to crack round its neck, and the Melon gives off a luscious odour, it may be separated from the plant, not only without injury, but with positive benefit to its quality. It is of immense practical importance to sever the connection so soon as practicable. Fruit-splitting, rotting, dropping, internal fermentation of juice, attacks of rodents and other vermin, all occur most frequently during the finishing stages. Hence the prudence of abridging the pending dangers as much as possible.

Storing of Ripe Melons.—The best place to store Melons is a warm kitchen-shelf, not too near the fire. Many have been utterly ruined by being left on hot soil or shelves right in the sun. Only considerable experience enables one to tell when any particular fruit is in the best condition for eating. Touch, smell, sight, all reveal perfect ripeness to the

initiated. Odour alone is a good test, easily patent to everybody. When this is at the full, the flavour, as a rule, will be at its best. But so many Melons are spoilt in the eating that these matters can hardly have too much attention. The majority of ripe Melons are improved by being kept from three to six days in a dry room before being eaten. Some sorts will keep much longer after cutting, but a damp place is fatal to the flavour of Melons.

Starting the Plants Afresh.—So soon as the fruit is cut, the dry regimen must once more merge into the moist and close one. The plants are overhauled and partially cut back, every faulty shoot or leaf removed, and the whole vigorously and frequently syringed overhead to prevent spider and thrip, and all the stimulating and growing forces incident to the quick method once more brought to bear on the plants. Within a fortnight or three weeks at the most, the plants are once more showing abundance of fruit, and these mostly set with a freedom and swell with a rapidity exceeding that of the first crop. Herein lies a danger that must be avoided by vigorous and timely thinning. The first crop should seldom be much or greatly exceeded, unless the plants have ample root-room and top-space, and may for these reasons be allowed to carry more fruit. Though not so absolutely essential to success to have the whole of the fruit on any given plant of one size—that is, as near abreast as may be—it is still important for the second and all succeeding crops, as otherwise, however promising a crop of five or six fruits of unequal size may prove for a time, the probability is that as they near maturity all will fail to ripen perfectly, with the exception of one or two of the largest. These break-downs, almost within sight of the dessert-table, are very provoking, and may readily be avoided by setting all the fruit intended to be grown on any given plant, not only on the same day, but the same hour, if possible. It is in thus starting the full complement of fruit at once, and rushing them through to the finish before starting more, that is found the most vital difference between Melon and Cucumber-growing. In the latter fresh fruit are being started and others cut daily. In Melon-growing a full crop is started at once and pushed through to the finish, to be succeeded by one or more successional crops, either on the same or on fresh plants. Occasionally a few later fruit may show and swell in succession to the main crop, but these are mere chancelings, and cannot be insured by skill.

Varieties for Express Culture.—As to varieties specially adapted for express culture, we have found Dickson's Best of All, Victory of Bristol, and Golden Perfection as good as any. But any Melon of good constitution, moderate size, and fertile habit, succeeds well under this mode of culture. As to size, such fine Melons as Queen Emma and Victory of Bristol have reached weights of from five to six pounds under it. Weights of three pounds are more useful and even more profitable. Melons ought to be eaten up so soon as cut, and very large fruits are almost as embarrassing as the proverbial white elephant, and should not be grown, as a rule, either under express or any other method of culture.

THE PALM FAMILY.

By William Hugh Gower.

Iriartea.—A small genus of Palms, named in honour of Juan Iriarte, a Spanish botanist. They are remarkable in having the base of their trunks elevated on numerous stout roots, which are diverging and cylindrical, thus giving the tree the appearance of being set upon stilts or props. These roots are sufficiently high in some cases to allow a tall man to walk under the base of the trunk. On account of the asperities with which these roots are furnished they are frequently cut into lengths by the natives, and used by them as graters, and hence have obtained the name of Rasp Palms. Iriartes are slow growers and somewhat difficult to cultivate. These plants require to continually stand in water, which should be about the same temperature as the house.

I. exorrhiza—the Brazilian name for this is the "Paxiuba"; it frequently attains a height of sixty to eighty feet; stem straight and cylindrical; leaves pinnate; the leaflets being somewhat flabelliform. Savannahs of the Orinoco.

I. ventricosa—on the Amazon this grand Palm is called "Paxiuba barriguda," in the Andes it is known as "Tarapoto," and on the Rio Negro as "Barrigou." Of this species, Spruce says "this is the noblest of the genus, known from its congeners by the fusiform swelling, or belly, mid-way of its trunk." It attains a height of from sixty to a hundred feet, the cone of exserted roots varying from five and a half to twelve feet. Rio Negro and Orinoco.

Iriartella.—This plant has been separated from the genus *Iriartea* on account of its slender stem and dwarfer habit, and somewhat different arrangement of its flowers. It is also peculiar in being "one of the very few Palms that send out prostrate suckers from the roots." Treatment same as *Iriartea*.

I. setigera.—The stem of this plant attains a height of from fifteen to twenty feet, although it seldom exceeds an inch in diameter; the leaves are pinnate, with præmose leaflets of a deep green. From the stems of this Palm the Indians form the

"gravatana," or blow-pipe, the weapon used when hunting game, and through which they blow their small poisoned arrows with wonderful precision. It is common throughout the region of the Rio Negro.

Kentia.—A family of smooth pinnate-leaved Palms of great beauty, and perhaps the very best of their class for decorative purposes. The plants were, until recently, named *Arecas;* sufficient differences were, however, found to establish them into a genus. In *Areca*, the growth from the seed is erect; in *Kentia*, it is, or should be, decumbent. In *Areca*, the seeds, when cut, have rings and layers of different colours, like a Nutmeg, whilst the seeds of *Kentia* are solid and horny.

Kentias have been called green-house Palms, and they will succeed in such a structure in the summer time, or even in the open air; they, however, are most beautiful when grown in the stove.

The flowers are borne on long, branched spikes, the male and female organs in separate flowers, and each female flower is supported by two males.

K. Australis—a slender, elegant, pinnate-leaved plant, with narrow leaflets nearly flat, and of a deep green colour. Lord Howe's Island.

K. Baueri—this is an old inhabitant of our gardens, and makes its stem very slowly; it is known also by the names of Areca Baueri and Seaforthia robusta. It is a handsome and useful plant for any situation, either in or out-doors in the summer time. Norfolk Island.

K. Belmoreana — this is popularly known as the "Curly Palm," and is a plant of great beauty; the leaves are very much arched, almost recurved, the dark green crisped leaflets giving it a very distinctive character. Lord Howe's Island.

K. Fosteriana—a robust and rapid-growing species; very similar in the young state to the other species.

K. gracilis—very graceful; very similar to Geonoma gracilis.

K. Lindenii—A fine robust-growing plant; also known as Kentiopsis Lindenii, and Cyphokentia Lindenii, and Cyphokentia macrocarpa. It is a bold plant, with large, arching, pinnate leaves, and reddish-brown petioles; leaflets sessile; the young entirely of rich deep crimson, which changes with age to intense dark olive-green. New Caledonia.

K. sapida—the Maori name of this Palm is "Nikau," and like many other aborigines in the Palm regions, they use the young flower-spikes as a culinary vegetable. We are told "it is the most southern plant of its order, occurring as far as lat. 38° 22′ south; whereas 38° is the limit of Palms in Australia; 38° in South America, and 30° in Africa." It is a robust plant, with a stout stem, which is twelve or fifteen feet in height; leaves pinnate, four to six feet in length; leaflets narrow, furnished with a grey scaly tomentum on the under side. A rather slow-growing, but very ornamental plant. New Zealand.

K. Wendlandiana—a slender-stemmed species of quick growth; its long arching leaves are pinnate, the leaflets slightly toothed, broad, and bright shining green. An extremely ornamental plant, and of hardy constitution. North Australia.

Latania.—This appears to be a native name; it is a small family of handsome fan-leaved, highly-ornamental Palms, distinguished from the genus *Livistona* by having a three-seeded fruit; the male and female flowers are produced on separate trees.

L. aurea, sometimes called L. Verschaffeltii — stem stout, fifteen to twenty feet high when mature; petioles smooth, rich yellow with a glaucous tinge at the base, two or three feet in length, bearing large fan-shaped leaves three to four feet across, and divided into narrow pointed segments. Island of Rodriguez.

L. Commersoni—very similar in habit to the preceding, but a little larger in all its parts. Round Island, Mauritius.

L. rubra—in growth quite the counterpart of the preceding species; the petioles are rich deep crimson, and the plaited leaves are the same colour when young, which, however, fades into a uniform deep bronze. Mascarene Islands.

Licuala.—A small family of fan-leaved Palms of great beauty, slender in the stem; some, indeed, scarcely making any. *Licuala* is a native name, and the plants belonging to the genus delight in an abundance of water. The stems of some species are brought to this country for walking-sticks.

L. acutifida—this and all the members of the family are slow-growing. The stems are from six to eight feet high, about an inch thick except at the base, where they are much swollen; these are surmounted with a beautiful crown of fan-shaped leaves. The stems of this species yield the walking-sticks known in this country as "Penang lawyers." Pulo Penang.

L. elegans—stem slender, petioles between two and three feet high, bearing stout black spines on the edges. Sumatra.

L. grandis — sometimes known as Pritchardia. This is a magnificent plant, leaves nearly orbicular, with a wedge-shaped base; much plaited, the edges divided into narrow bi-lobed segments; the upper side is rich shining green, pale below. Pacific Islands.

L. horrida—a stout-growing handsome plant; the petioles armed with very large and stout spines. Java.

L. peltata—this species also yields the "Penang lawyers"; petioles armed with large, sharp, black spines; the plaited fan-shaped leaves are præmorse at the edges; deeply divided and intense deep green. Pulo Penang.

Livistona.—This genus is not named in honour of David Livingstone, but after Patrick Murray, of Livingston, N.B. It comprises numerous species of highly-ornamental fan-leaved Palms. The flowers are perfect, and produced on branching spikes from amongst the leaves. Fruits one-seeded.

L. altissima—stem stout and tall; petioles some six feet long, armed on the edges with large recurved sharp black spines, the base enclosed in a rough network of brown fibres. Isle of Sunda.

L. Australis—this plant is often, but erroneously, called Corypha Australis. It attains a height of a hundred feet, carrying an immense symmetrical head of large fan-shaped leaves. Stem stout, bearing the scars of the fallen leaves; the base of the petioles, which are several feet long, is enclosed in a mass of fibrous network. Leaves nearly circular, three to four feet in diameter. In a young state this is perhaps the most useful Fan Palm for general decorative purposes. Australia.

L. Borbonica — this is the most familiar name of this plant, but it is more correctly named L. Chinensis. It is a most useful species in all its stages; and though hardy enough for the green-house, or even open air in summer, it prefers the stove during the winter months. Leaves much plaited, divided at the edges, a bright and cheerful shade of green; petioles armed with short reflexed spines. China.

L. Hoogendorpii—the stem stout; petioles long, deep brown, enclosed at the base in a network of dark fibres. The large fan-like leaves are nearly circular, divided into long

segments, which are not pendent; intense deep green. A magnificent plant. Java.

L. Jenkinsianus—the native name of this species in Assam is "Toko Pat;" its leaves are used for making hats, baskets, thatching, and various other purposes. In Sikkim, where it is rare, it is called "Julac-Myom." Its fan-shaped leaves are much plaited, some three or four feet in diameter. Northern India.

L. Olivæformis — a handsome plant, with less circular leaves than altissima, which it otherwise much resembles. Java.

Livistona (Latania) Borbonica.

Lodoicea.—This is one of the most extraordinary Palms in the world, or, at least, one of the most wonderful yet discovered. It is a native of some few small islands belonging to the Seychelles group. Smith remarks of this plant, "It is said to attain the height of a hundred feet, its stem being two feet in diameter, bearing at its summit a crown of fan-shaped leaves. It is remarkable for growing in a socket of a hard, woody texture, perforated with holes made by the roots. The fruit is a large, oblong nut, covered with a thin rind. After the removal of the outer envelope, or rind, the fruit has the appearance of two oblong nuts, firmly united together, and often weighs thirty to forty pounds. They are borne in bunches nine or ten in number, so that a whole bunch will often weigh four hundred pounds. It takes ten years to ripen its fruit, the albumen of which is similar to that of the common Cocoa-nut, but is too hard and horny to serve as food." Before its habitat was discovered, the nuts were found floating on the sea near the coast of the Maldive Islands, which led to the supposition that they grew in the sea, and they were called "Caco de Mer," or "Sea Cocoa-nuts," and were considered very valuable as presents, even to kings. The flowers are unisexual, each sex produced on separate plants.

L. Seehellarum (the Double Cocoa-nut)—the only species—is probably not in cultivation. The writer has had the seeds germinate at different times, but was never successful in growing them any length of time. The stem is perfectly straight, about a foot in diameter, bearing a large crown of fan-shaped leaves, some of which are "twenty feet long, and twelve feet wide." "It is said to attain a height of a hundred feet, and trees of this size are supposed to be about four hundred years old." "From the age of fifteen to twenty-five years it is in its greatest beauty, the leaves at this period being much larger than they are subsequently." Seychelle Islands.

Malortiea.—A genus containing a few dwarf plants, which have slender Reed-like stems, that are clustered and bear their usually simple leaves upon long and slender foot-stalks. They are nearly allied to *Chamædorea* and *Geonoma*, and thrive under the same treatment.

M. gracilis — stem very slender, ringed with the scars of the fallen petioles; leaves some six inches long and nearly as broad: The blade of the leaf is partially split near the rachis, which has led to its being named by several horticulturists, M. fenestrata, or Window Palm. It is valuable for all purposes of decoration where small plants are required. Guatemala.

M. simplex—stem slender, clustered like the preceding, about two or three feet high; petioles long and slender; blade of leaf oblong-ovate, bifid at the apex, coarsely toothed at the edges. A beautiful little tree. Costa Rica.

Martinezia.—A genus of pinnate prickly Palms named in honour of B. Martinez, a zealous Spanish naturalist. They are all plants of moderate growth, but not sufficiently hardy to thrive without heat for any length of time. Male and female organs in separate flowers upon the same spike.

Martinezias, like all very prickly Palms, enjoy an abundant supply of water. They very much resemble *Caryota* in a young state, but may be easily distinguished by their simple pinnate leaves, whilst *Caryota* is perfectly smooth, with bipinnate leaves, and the only genus thus distinguished.

M. Caryotæfolia—this is the tallest species, attaining a height of about thirty feet; stems slender, and with the petioles profusely armed with long, slender, black spines; leaves pinnate, about six feet long; leaflets wedge-shaped, aggregated, the edges ragged as if bitten off, deep green. Peru.

M. Granatensis — a dwarf species, the pinnate leaves some two or three feet in length; leaflets oblong-ovate, evenly serrated on the edges; petioles and stem armed with long and slender dark brown spines. Columbia.

M. Lindeniana—stem slender, with long pinnate leaves; leaflets cuneate, or three-sided, with præmorse edges, the terminal lobe much the largest. Peru.

Mauritia.—A genus named in honour of Prince Maurice of Nassau. The plants are said to grow to 100 or even 150 feet in height, but Spruce does not note any kind with a stem higher than about forty feet, and he enumerates more than a dozen species. They abound on the banks of the Amazon, Orinoco, and Rio Negro, and become partially submerged during the periodical overflow of these rivers.

To grow *Mauritias* in our plant-houses, they must be plunged into a tank of tepid water.

These plants bear very large heads of flabellate leaves, and numerous much-branched flower-spikes; the flowers are unisexual, and borne on distinct trees, but sometimes they are mixed. The fruits are large, and covered with hard, imbricating, deep brown scales.

M. aculeata—this species grows from twenty to twenty-five feet high, with leaves deep green above, silvery-white beneath. Rio Negro.

M. carana—a stout stem, some forty feet high, distinguishes this from most of the species. It carries an enormous crown of flabellate leaves. Rio Negro.

M. flexuosa—this is said to grow to an immense height; the stems are about two feet in diameter, bearing a splendid head of fan-shaped leaves. It is the "Moriche Palm" of the Guaranas Indians, who form dwellings among the stems (for these trees grow very close together, forming dense forests); from its leaves they make ropes, and thus hammocks; from its sap they make wine, and from its stem they obtain a kind of sago. As a young plant, its deep green fan-shaped leaves are very handsome. The banks of the Rio Negro, Amazon, and Orinoco.

M. Martiana—this species always grows in clusters; the stems are slender, from twenty to twenty-five feet high, and are densely armed with long sharp spines. The banks of the Amazon and Rio Negro.

M. vinifera—a tall-growing species, the stems of which are not furnished with spines. Leaves flabellate, deep green on both surfaces. From this plant, which is called "Buriti" by the natives, is obtained a quantity of wine of a pleasant flavour. Brazil.

Maximiliana.—A name given in honour of Prince Maximilian to a noble-growing Amazonian Palm. The spathe of *M. regia*, which contains the seeds, is boat-shaped, very woody in texture, some five or six feet in length, and nearly two feet wide. It is used by the Indian women as cradles for the infants, and as these spathes are persistent, remaining on the trees for several years, there is always a cot to be had for the fetching.

The Indians who collect and prepare the "bottle-rubber" of commerce, use the seeds of this plant for fuel in its preparation; they also use the leaves for thatching and other purposes. The flowers are unisexual, borne on the same plant, but not always upon the same spike.

M. Inajai is a species which Spruce says is very elegant, and a much dwarfer plant than M. regia. "Its stems are slender, and from ten to twenty feet high, with a beautiful crown of feathery, light green, pinnate leaves, the boat-like spathes remaining on the trunk for years, and have a very peculiar appearance." We have not seen any plants sufficiently established yet to show their character. In forests of the Rio Negro.

M. regia—this is a giant amongst Palms. The stem is cylindrical, stout, and upwards of 100 feet high, and bearing a large crown of pinnate leaves from

thirty to fifty feet long. In a young state it is very handsome; the pendent leaflets give the leaves the appearance of a beautiful plume. The largest example of this species existing in Europe is in the Botanic Gardens of St. Petersburg, and it is over sixty feet high. Spruce says "the native name is 'Cocurito Palm,'" and that it is "common in the primitive forests of the Amazon, on the granite peaks wherever it can gain a hold."

Œnocarpus.—This genus is nearly allied to *Euterpe*. The name comes from *oinos*, "wine," and *karpos*, "a fruit," the plants yielding oil and wine, but the same name might apply to many other Palms. The flower-spikes are stiff and branched, the separate sexes being on the same branch; fruits one-seeded, enclosed in a black, fibrous, oily flesh. Some of the species yield an excellent colourless oil, either for burning or culinary purposes, and mixing with olive oil.

Œ. Bacaba — stem stout, smooth, fifty to sixty feet high, with long pinnate feathery leaves; leaflets (in the old plants) clustered, pendulous, and dark green. In a young state they are also very handsome. Forests of the Amazon.

Œ. Batava—this species is dwarfer; leaves about fifteen feet long; the pendulous leaflets are not clustered, as in the "Bacaba Palm," neither does it carry so large a crown of leaves. Forests of the Amazon.

Œ. minor — a handsome stove Palm; stem slender and naked, fifteen to thirty feet high; leaves pinnate, with a very feathery appearance, some six feet or more in length. In woods on the Rio Negro.

Œ. Patana—this species is one of the giants amongst Palms in South America. The stem attains a height of from eighty to a hundred feet or more, bearing a splendid head or crown of beautiful pinnate, feathery leaves, from forty to fifty feet long, the leaflets being pendent, and upwards of five feet long and four inches wide, rich deep green. Its stout, straight spines, varying from one to three feet in length, furnish the Indians with the darts which they blow from the "gravatana." In Venezuela it is called "Seje;" in Brazil, "Patana." Brazil and Venezuela.

Oncosperma.—The name is derived from *oghos*, "a hook"; and *sperma*, "a seed"; but the seeds are not hooked. The family is allied to *Areca* through the spiny *Acanthophœnix*. The species are beautiful stove ornaments, but not sufficiently robust to be used for general decorative purposes. The natives use the young heart-leaves as Cabbage, and the trunks for building their houses.

O. fasciculata—an elegant species, with a slender stem, furnished with beautiful pinnate leaves; the leaflets are long, pendent, and dark green; petioles densely clothed with long, black, hair-like spines. Java.

O. Van Houtteanum—stem slender, sheathing petioles and midrib of leaf a dull red, with long, dull red, needle-like spines. Java.

Phœnix.—This family of Palms supply us with the well-known Dates; the species which produces this fruit is largely cultivated over the northern part of Africa, and, like all cultivated fruit-trees, breaks into numerous varieties. In these countries Dates form the principal food of a great portion of the population, and, indeed, nearly every part of the plant is turned to use by the Arabs. In our hothouses, they form splendid ornaments, and they can also be used with great effect for general decorative purposes in a young state, though reaching to a great height with age.

P. acaulis — this species forms little or no stem; leaves, when mature, three feet or more long, pinnate, spreading; leaflets narrow, the basal ones reduced to mere spines; deep green. Sikkim, where it is called "Schap."

P. dactylifera (the Date Palm)—it attains a height of fifty to eighty feet; when young the leaves are somewhat erect, pinnate, with long linear-lanceolate, slightly glaucous green leaflets. N. Africa.

P. rupicola—of this beautiful plant Dr. Anderson says, "It is easily distinguished from all others of the genus by its long slender stems; by its soft delicate foliage, like the leaves of the Cocoa-nut." Sikkim.

P. tenuis—this is a very graceful species; its long leaflets are pendent, narrow, and bright deep green; its slender leaves render it a valuable plant for table decoration. East Indies.

Phytelephas.—The name of this genus comes from its fruits: thus, *phyton*, "a plant"; *elephas*, "an elephant"; the nuts yielding vegetable ivory, from which so many of our toys, knobs for umbrellas, doors, &c., are made, and said by the turners to come out from the lathe whiter than animal ivory. These plants form dense woods, to the exclusion of almost any other plants; their flowers are unisexual, and borne on separate plants; the female makes a stout decumbent stem, rooting from its under side, and producing its large nuts upon a short spadix from between the leaves; the male plant is more erect, although it never makes a tall stem.

P. æquatorialis "differs chiefly from the other species in the stout and often quite erect trunk, reaching fifteen, or even twenty feet in height; in the unequally pinnate leaves; the leaflets being not equidistant, but aggregate by threes and fours along the rachis. Native names, 'Cadi' and 'Corozo'; it abounds on the plains of Guayaquil."

P. macrocarpa—the Vegetable Ivory Nut. Leaves pinnate, ten to twenty feet long; leaflets narrow and flat, carried down nearly to the base of the petiole, thus forming a large, somewhat ovate, feathery, dark green plume. Of this plant Spruce says, "The characters of P. macrocarpa are either to have no trunk at all, or a very short and stout one, which is nearly always inclined or crooked." Peruvian Andes.

Pritchardia.—A small family of handsome fan-leaved Palms, first discovered and introduced by the late Dr. Berthold Seemann; they form splendid ornaments in the stove, but are not sufficiently hardy for general purposes. Although quite destitute of spines, they enjoy an abundant supply of heat and moisture.

P. Martii — stem slender; whole plant smooth; base of petioles enclosed in a tissue of rough fibres; leaves large, flabellate, plaited like a fan. Fiji Islands.

P. Pacifica—a grand species; stem slender, smooth, saving the few rough fibres which surround the base of the petioles; these are covered with a scaly, grey tomentum; leaves large. Fiji Islands.

Ptychosperma.—This family contains several handsome, unarmed, pinnate-leaved species, which are of great value for general decorative purposes, and will withstand a somewhat low temperature with impunity, provided of course that reasonable care be taken in their culture. Many more species of this genus may be fairly expected from New Guinea as the region gets more thoroughly explored.

P. Alexandræ—stem stout, erect, ringed with the scars of the fallen leaves, and forming a large mass of roots round the base; leaves long, arching, and pinnate; leaflets pendent, when young reddish-pink, but changing with age to deep green. North Australia.

R. Cunninghamii—this plant will be more familiar probably under the name of Seaforthia elegans; the stem is stout and smooth; leaves long and plume-like; leaflets long, pendent, and bright green; the petioles are clothed with a scaly tomentum when young. Northern Australia.

P. rupicola, synon. Laxococcus rupicola—a beautiful dwarf-growing plant; stem rather stout, smooth, ringed with the scars of fallen petioles; leaves three to six feet long, a bright crimson when young, which gradually gives way to deep green. Ceylon.

Raphia. — These plants are extremely handsome, having large spreading, pinnate, plume-like leaves, They resemble the members of the genus *Sagus*, but, unlike them, their flower-spikes are not terminal. These flower-spikes, however, are something remarkable. They are much branched, pendulous, and upwards of twelve feet in length, bearing an enormous quantity of fruits; the whole spike, when laden with ripe seeds, frequently weighing two hundred pounds. The fruits in form and size resemble a large egg, covered with hard and shining imbricating scales, varying in colour from pale brown to deep chestnut. The species are superb as garden ornaments, though rare, as they require a tank of water to grow them well.

PTYCHOSPERMA CUNNINGHAMII.

R. Hookerii—a magnificent species; stem slender, unarmed, retaining the bases of the old petioles for some time; these are enveloped in a mass of soft curling fibres; leaves immense, forty to fifty feet long, beautifully arched; leaflets narrow, closely set and deep green. It has the appearance of a gigantic plume. The natives call this plant "Ukot," and obtain from it large quantities of a pleasant wine. Cameroons and Old Calabar, West Africa.

R. longiflora—stem somewhat stout, unarmed, but rough and bristly with the persistent bases of the old petioles; it produces very long flower-spikes, and gigantic plume-like pinnate leaves; the leaflets flat, and a rich green. Island of Corisco, West Africa.

R. Ruffia—this species has the same peculiarity (before mentioned) as the "Lodoicea" of growing in a large bowl or socket. It has stout smooth stems, the giant plume-like leaves often fifty feet long, with leaflets closely set, flat, and more than a foot in length. Mauritius and Madagascar.

R. tœdigera—the "Jupati Palm," as it is called by the Indians of the Amazons—is a bold species, with ringed stems, bearing gigantic plume-like leaves, thirty to fifty feet long. Spruce says, "This is the only scaly-fruited Palm of America with pinnate leaves, all the other scaly-fruited kinds having fan-shaped leaves, whilst all the scaly-fruited Palms of Asia and Africa are pinnate." Banks of the Amazon and its tributaries.

Rhapis. — Small-growing Fan Palms, nearly related to *Chamærops*. Their small size and elegant appearance render them very useful for decorative purposes. The walking-sticks called "Ground Rattans" are the produce of this genus.

R. flabelliformis — stem slender, the petioles very thin, enclosed at the base in a network of black fibres; leaves flabellate. The plants attain their true character when only a few inches high, and their leaves remain on almost to the base of the stem when even six or seven feet high. China and Japan.

R. flabelliformis variegata—this is a somewhat slow-growing form; the flabellate leaves are alternately streaked with yellow, green, and white. Japan.

R. humilis—in general habit this does not differ from the preceding; the leaves, however, are much handsomer, more fan-shaped, and the segments pendulous; intense deep green.

Sabal.—A bold-growing family of Palms with gigantic fan-leaves, and in some instances very stout

stems, all from the Western Hemisphere, and almost rivalling their Eastern relatives, the *Coryphas*. These plants are very hardy, and are extremely useful for any purpose where bold foliage is desired.

S. Blackburniana—a magnificent species, with stout, erect stem, thirty feet or more high, bearing an immense crown of very large, almost circular leaves. W. Indies.
T. umbraculifera — this plant resembles the last-named in all respects saving colour. The leaves of this are not glaucous, but deep green; neither is the point of attachment white. West Indies.

Sagus.—This is the Malayan name for "bread," and is given by them to some Palms that yield sago, which is the soft inner part of the stems of these plants. The trees which produce the finest sagos of our shops are *S. lævis* and *S. Rumphii*, sometimes called *Metroxylon*. There are other Palms, however, which yield sago, but not of such good quality, nor in such quantity. Naturally they grow in swamps, and must be abundantly supplied with water to develop and support them in perfection. It requires about three years to ripen the fruit, which are covered with large, hard, imbricating scales, shining as if polished.

S. filiare (Metroxylon)—a somewhat slender-growing species; the stem and petioles are profusely armed with long, slender, needle-like spines. Indian Archipelago.
S. lævis (Metroxylon)—this is the smooth Sago Palm, and the kind which yields the largest quantity. Stems stout, smooth, saving the old remnants of the leaf-stalk, which often give it a rough appearance; twenty to thirty feet high, or more; leaves broad, somewhat erect, pinnate; these resemble splendid dark green feathers, and are usually as long as the stem, so that a tree twenty feet high would have a leaf twenty feet long; specimens of the leaves have been sent home upwards of forty feet long. Indian Archipelago.
S. Rumphii (Metroxylon)—a dwarfer plant, with the same habit and appearance as the preceding species, saving that the petioles are armed with stout spines an inch long. It bears a crown of beautiful plume-like leaves, which are somewhat arched and spreading. Indian Archipelago.

Stevensonia.—This name was given to the only species yet discovered, to commemorate the kindness and warm interest taken by Governor Stevenson in all scientific adventures and explorations. The plant was sent from the Mauritius under the MS. name of *Sterensonia grandifolia*, to that prince of botanists, and thorough English gentleman, Sir William Hooker, then Director of the Royal Gardens at Kew. There are an immense number of small islands between the Mauritius and the Seychelles, far too small to be shown upon any map, and yet they nearly all have some plant peculiar to them. To these islands Mr. Duncan, of the Botanic Gardens in the Mauritius, directed his researches, ably backed by the then Governor of the Mauritius and its dependencies, Stevenson, and the result was the discovery of many of the handsomest Palms we have in cultivation, besides numerous other plants found to be new. A mishap, however, befell one of these plants after its arrival in England, and it was found on the Continent under the name of *Astrocaryum aureopunctatum*, but as it was quite a new genus it obtained in Germany the name of *Phœnicophorium*, or Stolen Palm, or Thief Palm.

S. grandifolia—a magnificent stove Palm, but too much a lover of heat to allow of its use for any other decorative purposes. Stem stout, and with the sheathing petioles densely armed with very long, black, needle-like spines, some four inches long; leaves entire, with a deeply bilobed apex, much plaited, six to ten feet in length, the edges regularly split into acuminate segments, deep green, profusely spotted over its entire surface with orange-coloured spots; the petioles are dull orange, and the young leaves when unfolding are of a rich coppery-orange, changing with age to deep green. It is without exception the most majestic Palm ever introduced to this country. Seychelle Islands.
S. grandifolia, var. viridifolia—this is a form which has originated from imported seeds; it is destitute of the orange-coloured spots on the leaves, and the petioles also are green; in other respects the plants are identical. Seychelle Islands.

Thrinax.—A genus of handsome small-growing, fan-leaved Palms; indeed, their name comes from the shape of the leaves, and signifies a fan. The genus is distinguished by its flowers having a six-parted calyx, destitute of a corolla, stamens varying from six to twelve, joined at the base, and a funnel-shaped stigma. The various species are all handsome, and sufficiently hardy to withstand cool treatment.

T. arborea—stem slender; petioles supporting a large fan-leaf, deeply divided into narrow segments, upwards of two feet across. West Indies.
T. graminifolia—a slender-growing and handsome plant, with long and thin petioles; leaves fan-shaped, divided into narrow segments, bright green above, with a glaucous tinge on under side.
T. multiflora—a superb plant, attaining a height of twenty feet; stem slender; petioles long and thin; the fan-leaf some three feet across, divided at the margin into long pendulous segments, bright green above, the reverse side silvery-white. Central America.
T. radiata—stem swollen at base; petioles slender, about two feet long, and dull orange-yellow, enclosed at the base in a network of fibres; leaves nearly circular, upwards of two feet across. West Indies.

Verschaffeltia.—This genus is named in honour of Ambrose Verschaffelt, a Belgian nurseryman, and a great cultivator of Palms. It forms a stem quickly, and rises above the ground upon an inverted cone of roots in the manner of the Rasp Palms (*Iriartea*). Magnificent stove plants, but rather too tender for general purposes of decoration. For treatment see *Stevensonia*.

V. melanochœtes — stem cylindrical, stout, and clothed with long, slender, black spines: leaves, when young, entire, some four feet long, plaited. Seychelle Islands.
V. splendida — this grand species has a slender stem and, like the sheathing petioles, it is densely armed with long, needle-like, black spines, two to six feet in length, plaited, and deeply bifid at the apex. Seychelle Islands.

Welfia.—The name is a transformation from "Guelph," and the genus includes a few small-growing and extremely handsome plants; they are useful for table decoration in a very young state, and are beautiful ornaments at any time.

W. Georgii—stem slender, destitute of spines; leaves pinnate; leaflets sessile. Costa Rica.
W. Regia—this is a more slender species; whole plant smooth, bearing long, pinnate, arching leaves, with pendent leaflets; when young the entire leaf and petiole is rich, bright crimson, which gradually fades away to bright, shining green. New Grenada.

PROPAGATION.

THE FORMATION OF VARIETIES.

By John Fraser.

THE phenomena of fertilisation, the construction of flowers, and their adaptation to the requirements of insects, have been treated of under the head of Fertilisation, Vol. III., pp. 187-192.

To provide for the accomplishment of this act, nature furnishes many and varied means, a few of which have already been mentioned. Having learned the importance of fertilisation, and knowing also that our improved fruits, flowers, and vegetables have been remoulded from the parent wildings, to please the fancy or meet the necessities of man, we are all the more encouraged to enter this wide field of labour, where there is unlimited scope for our abilities, and plastic nature, so to speak, is in our hands.

Nature herself brings about changes and improvements; but some of her handiworks have taken ages for their accomplishment, whereas man, on scientific principles, and by careful intelligent working, can bring about marvellous results in a comparatively short time. Furthermore, natural productions are fitted to compete with other plants, and perpetuate their existence, in that part of the world where created. On the other hand, artificially created plants, or those produced by the agency of man, require his assistance for their propagation, dissemination, and preservation, in proportion to the extent they differ from the original wilding.

As the chief aim of the gardener and hybridist is to improve existing varieties, or produce new forms, this wide subject may be considered under the following three headings:—

I. Hybridisation, or the crossing of species and genera.

II. The intercrossing of varieties.

III. Selection.

I. Hybridisation.—The art of hybridisation, when applied to the intercrossing of species or even genera, is not only more fascinating, but opens up a far wider field of unexplored territory, and requires even more intelligence to conduct it properly, than the mere crossing of varieties. The difference, however, between species and varieties is merely one of degree, and quite arbitrary, made to suit the convenience of botanists. This was recognised at least as early as the days of Herbert, whose leading idea, nevertheless, was that every species that would hybridise with another should be included in the same genus. But we have now authentic records of numerous bigeneric hybrids, and on the other hand, find that in some instances it is as difficult to hybridise varieties as it is good recognised species. This is notably the case in dimorphic and trimorphic flowers of the same species, the latter represented by *Lythrum salicaria*, and the former by *Primula*, as well as others to the number of forty genera scattered through various natural orders.

Granted that we keep within a certain degree of systematic relationship, the other obstructions that bar the way to freedom of intercrossing, and fertility of the offspring, are chiefly to be found in differences affecting the reproductive elements, and the changes they have undergone during many successive generations, while acting independently of one another. For instance, of two species with pollen very different in size, the pollen-tubes of the smaller grains would be able to penetrate the larger-canalled style, while the hybridist would be unable to obtain a reciprocal cross from the same two species, by reason of the larger pollen-grains being unable to penetrate the narrow passages of the style. The different lengths of style will also offer obstacles to the pollen in attempting to reach the ovule.

In the case of the Strawberry, *Fragaria*, the flowers are polygamous-dioecious, either functionally or morphologically, or both, and proterogynous, that is, the pistil matures first. This is a great assistance to the hybridist, enabling him to remove the stamens before shedding their pollen. *Fragaria vesca* presents serious difficulties in forming a union either with Hautbois or the American species. Such a stock would be desirable, because thoroughly inured to our climate. Hautbois is generally unisexual, and supposed to have originated from *F. vesca*. To be able to infuse its peculiar and agreeable flavour into a stock worth cultivating would be an acquisition. Williams, of Pitmaston, succeeded in effecting the first cross, but the fruit of the resulting progeny was almost invariably seedless, a notable instance of the pollen affecting the fleshy receptacle, and yet lacking the physiological potentiality of producing an embryo. *F. Virginiana*, *Chiliensis*, and *grandiflora*, belonging to widely separated parts of America, intercross with the

greatest freedom under domestication, and the resulting progeny is perfectly fertile.

The method of procedure is simple. First of all, carefully remove the stamens of the plant to be operated upon, procure pollen from an older flower of the intended male parent, and having applied it to the pistil of the flower to be operated on, with a camel's-hair pencil, cover the flower with fine netting to prevent any further access of pollen.

The genus *Rosa* includes about thirty good species, but so variable are they, even in a state of nature, that authors entertain extreme opinions as to the number that ought to be admitted as species. About two hundred and fifty are enumerated, and many would find no difficulty in augmenting the list to double that number. Du Hamel says that "nature appears scarcely to have placed any difference between the different species of Rose; and if it is already very difficult to define the wild species, which have not yet been modified by culture, it is almost impossible to refer to their original type the numerous varieties which culture has made in the flowers of species already so nearly resembling each other." If we comprehend the full meaning of this extract, there will be little difficulty in understanding why the numerous forms offer such facilities for the almost indiscriminate intercrossing known to exist under cultivation. The stamens are exceedingly numerous in many series, and come to maturity at the same time as the pistil. The styles are also numerous and collected in a bundle just protruding from the throat of the calyx, or projecting beyond it some distance in a single column, as in *R. Brunonii*, and our native *R. arvensis:* most favourable conditions for the success of the hybridist.

When about to hybridise two species, select the earliest and best flowers, and carefully protect them from insect or other intruders, even for some time previous to their expansion. As soon as this happens, remove the stamens immediately from the intended seed-bearer, and apply the pollen of the male parent, when the stigmas are in a receptive condition. Protect as before until all danger of foreign pollen taking effect is over.

Notwithstanding the fact that about one hundred and seventy species of Pelargonium are known, the cultivated varieties at present grown are the descendants of four or five original species. This is the more remarkable, considering the varied and endless diversity of habit and foliage to be found in the genus. The bedding or zonal section have been obtained from the numerous interbred progeny of *P. zonale* and *P. inquinans;* the Ivy-leaved section from *P. peltatum*, and the show and fancy varieties from *P. cucullatum*. The flowers of the genus are proterandrous, that is, the anthers are ripe before the stigma, each containing ten stamens, of which seven are fertile, rarely fewer. When the anthers are mature and about to shed their pollen, they occupy a central position, while the pistil is scarcely at all visible. One by one the anthers shed their pollen and drop away. The pistil now develops, and when the five radiating stigmas have fully expanded, a velvety-looking, or pubescent line, along the upper or inner face of each, proclaims that they are ready for fertilisation. The operator will now see that the flowers to be pollenised must be of different ages, that is, the pollen to fertilise any given flower must be obtained from a younger, or one just expanded. There are exceptions to this rule, however, in some of the pale-flowered mongrels of *P. zonale* and *inquinans*, where the pistil tends to early maturity, and being short, is fertilised by its own pollen. This is very evident in the variety *Christine*, which persistently sets itself freely, especially when planted out of doors. The careful hybridist, however, will take measures in advance of this, and remove the anthers as well as protect the flowers at an early date. He will also carefully tabulate or label the flowers operated upon, for future reference.

The vast order of Orchids, containing some four or five thousand well-marked species, is becoming yearly of more engrossing importance, not only from a popular, but a scientific point of view. The hybridisation of Orchids is only in its infancy, but unfortunately there is little prospect of its ever becoming so universally practised in gardens as on many popular florists' flowers, not merely on account of their value, but their slow rate of increase, and the difficulty of rearing them in our comparatively sunless winter seasons. The art is by no means so difficult to learn as would at first sight appear, although the natural process is often very complicated indeed, and sometimes almost inexplicable.

The extraordinary construction of an Orchid presents the most serious difficulty. The segments of the perianth, known as sepals, petals, and labellum, six in number, present endless modifications in shape, direction, and colour; but the column, consisting of the amalgamated style and six stamens, is even more disguised in its homologies with the same parts in other flowers.

The ways and means by which the members of these different groups are fertilised in a state of nature are extremely numerous and often complicated. In effecting artificial hybridisation, however, all that is necessary is to remove the pollinia from the anther-cells, and transfer them to the viscid stigma of the intended female parent. The chief difficulty attending the operation is the incon-

venience of getting at the pollinia, or in applying them to the stigma, without injury or seriously manipulating the flowers operated upon, when the sexual organs are deeply seated in a narrowly tubular perianth as in *Masdevallia amabilis*, *M. Veitchii*, and those species of *Cattleya* or *Lælia* where the column lies almost or quite close on the labellum. The readiest means in the latter case would be to depress the labellum with one hand, and apply the pollinia with the other. A small, neatly-pointed forceps, or pencil-like instrument, with which to remove the pollinia from one flower and apply them to another, would be convenient. In the case of *Vanilla*, some manipulation is necessary in order to effect fertilisation, but on the other hand, *Oncidium*, *Odontoglossum*, together with many of the finest genera, offer the greatest facilities for performing the operation.

Amongst Orchids, perhaps, there is no more remarkable case than that of *Catasetum*. The rostellum is prolonged into two slender, sensitive processes known as antennæ, which, when touched, have the power of rupturing the anther, and the strongly-elastic pedicles of the pollinia straightening themselves, eject the pollen-masses with considerable force. The object here is to secure the pollinia and prevent their being lost. The flowers of the genus are male, female, and hermaphrodite. The females are devoid of antennæ, and the viscid stigma is large and easily accessible. The pollinia are remarkable for the enormous size of their gland, by which they attach themselves to whatever object, insect or otherwise, they happen to strike when ejected from the anther-cases.

The great object in all these elaborate contrivances, and the highly modified organs in the whole Orchid order, is to secure the safe transfer of the pollen from one flower to another, with the least possible loss, which means conservation of energy. The pollen, moreover, is valuable on account of the quantity required to fertilise the thousands of ovules present in the ovary.

A small, but not the least important group, the *Cypripediæ*, includes the remaining genera of the order. Here, in opposition to all the other groups, the stigmatic surface is convex and dry, while the glutinous and granulose pollen effects the union or adhesion of one to the other, aided, no doubt, by the roughness or looseness of the tissue of the stigma itself. The slipper of *Cypripedium* is another splendid piece of mechanism or contrivance, by which fertilisation is insured in one of two ways, according to the direction an insect inserts its proboscis, so as to fertilise it with its own pollen, or failing that, to carry the pollen to another. There are two fertile anthers belonging to an inner series of three in this group, and owing to their position at an opening near the base of the labellum, they are readily accessible and removable, when, by gently depressing the labellum of the same or another flower it is intended to fertilise, the convex inner surface of the stigma, which lies immediately behind the staminode, can easily be reached so as to apply the pollen.

How and when to fertilise are vital points of practice that only considerable experience can solve. The flowers of Orchids remain a long time in a fertilisable condition, and they attain this state shortly after they are fully expanded. The general appearance, together with the odour arising from fragrant species, the viscidity of the stigmatic disc, and the readily removable pollinia, are all distinctive marks that fertilisation may be effected. If this has happened it will very soon be indicated by the early fading of the perianth. It does sometimes, though not frequently, happen that the pollinia are removed by insects in our hot-houses, consequently the careful hybridist will protect the fertilised flowers till all danger from the possible access of other pollen is averted, and at the same time accurately tabulate his experiments.

The following extracts are from a valuable paper read by Mr. H. J. Veitch at the Orchid Conference, held at South Kensington, Wednesday, May 13th, 1885. "It was Mr. John Harris, a surgeon of Exeter, who suggested to Dominy the possibility of muling Orchids, and who pointed out to him the reproductive organs situated in the column, and showed that the application of the pollinia to the stigmatic surface was analogous to the dusting of the stigma of other flowers with pollen. This simple fact being once fairly grasped, the work of fertilisation proceeded apace. The flowers of showy species of *Cattleya*, *Lælia*, *Calanthe*, &c., were fertilised with the pollinia of other species, and even the flowers of supposed different, but of course allied genera, were also operated upon in the same way. Capsules were produced in abundance, which in due course proved their maturity by dehiscing, and thus the long and anxiously desired seed was at length at hand.

"Among Cypripeds some very curious facts have been elicited through muling. Thus, the East Indian species cross freely with each other, and a numerous progeny has resulted therefrom. The South American species, the *Selenipedia*, as they are called, also cross freely with each other, and many new forms have been obtained; the hybrids in both sections flower within a few years of the seed being sown. But in the case of the crossing of Indian with South American species, the process has been much slower in producing results. An infinitely smaller percentage of the seed germinates, and those

seedlings that survive are so slow in arriving at the flowering stage, that up to the present time not a single plant has produced a flower, although the plants continue strong and healthy in appearance, and increase in size every year. One thing is certain, the three-celled ovary of the Selenipeds offers no impediment to the fertilisation by the pollinia of Cypripeds with a one-celled ovary, for we have plants raised from *C. caudatum* and *C. barbatum*, and many other like crosses between other species have yielded seed.

"*C. Sedeni* was a remarkable cross in many respects; it was, in fact, raised from two crosses—*C. Schlimii* and *C. longifolium*, and the same two *vice versâ*. It will be observed that in this case one of the parents, *C. longifolium*, is much more robust in habit and growth than the other parent, *C. Schlimii*. No perceptible difference was observed between the plants raised from the two separate crosses: they agreed in habit, foliage, colour of flower, in fact in every particular. No such similar result has been obtained by us amongst Cypripeds: a *vice versâ* cross between the same two species, produces seedlings that vary more or less from those produced from the first cross. Thus *C. tessellatum* resulted from *C. barbatum and C. concolor*, and *C. tessellatum porphyrium* from *C. concolor* and *C. barbatum*. We have also an instance of two recognised species, each being crossed by a third, but both crosses producing like results. Thus *C. longifolium* and *C. Schlimii*, and *C. Roezlii* and *C. Schlimii*, produced seedlings whose flowers are indistinguishable from each other, although, as might be expected, the foliage of the *C. Roezlii* progeny is, like that of its parents, the more robust of the two; hence the specific rank of *C. Roezlii* is very questionable.

"Not only do recognised species of each section, East Indian and South American, cross freely *inter se*, but the hybrids also cross freely with them. The beautiful *C. ænanthum superbum* has for its parents the *C. Harrisanum*, itself a hybrid, and *C. insigne Maulei*. As regards the habits and foliage of hybrid Cypripeds, the progeny usually takes a form intermediate between the two parents, but sometimes it is more robust than either.

"I may here state that the late Mr. Bentham, when working up the Orchids for the 'Genera Plantarum,' must, I think, have been misinformed when he states under *Miltonia vexillarium*, p. 563, that '*fide hortulanorum facile cum Odontoglossis variis nec cum Miltoniis genus proles hybridus gignunt.*' Our experience is the very opposite of this. *M. vexillarium* crosses readily with the flat-lipped *Miltonias* and *spectabilis*, although thus far we have failed to raise any progeny from these crosses, but not with true Odontoglots; often as it has been attempted, no capsules are produced. Thus while our experience in muling amongst Odontoglots goes far to disprove the statement I have just quoted, it at the same time confirms unmistakably Mr. Bentham's view as to the proper generic place of *vexillarium* and its allies, *Roezlii Phalænopsis*, and *Warscewiczii*."

The question of bigeneric hybrids is an important one, and opens a wide field for inquiry, discussion, and experiment. It is less practicable, more uncertain in result, and in short becomes more and more impossible as we progress from the equator towards the poles of relationship in plants. Some are sceptical enough to deny the possibility of producing a single bigeneric hybrid. Dean Herbert believed that all species capable of intercrossing belonged to the same originally created genus; and the views of many modern workers in the same field, if they do not exactly coincide, run nearly in the same channel. But, considering that genera are often as artificial and arbitrary as are species, it is simply impossible to lay down a definite law or limit, up to which and beyond which hybridisation cannot be effected. The whole thing depends on the amount of differentiation in the sexual or reproductive elements. Dean Herbert himself (and Darwin had a similar experience) found within the limits of the same genus (*Crinum* for instance) a scale of productiveness amongst intercrossed species, ranging from perfect fertility to perfect sterility. The same results accrue in the crossing of varieties in some instances, and individuals or the di-tri-morphic forms of species frequently present the same or greater unwillingness to interbreed than do forms which we are bound to recognise as good species if we are to retain the latter term in classification at all.

Thus we may safely conclude that genera, species, and varieties merely differ in degree, not in kind; that our delimitation of them, in the truest sense of the word, is artificial, arbitrary and of convenience, and that nature lays down no hard and fast lines, such as the botanist or naturalist would fain concoct for their classification purposes.

The reputed bigeneric hybrids are few, and some of them may be reviewed for the purpose of defining what is meant by the term. *Sericobonia Penrhosiensis* was obtained by crossing *Libonia floribunda* with *Sericographis Ghiesbreghtiana*, producing a plant very much dwarfed in stature, with feeble diffuse branches and larger flowers than the female parent, with the colour of the male.

A batch of seedlings have recently been raised between *Cyrtanthus sanguineus flammeus* and *Vallota purpurea*. The latter is the pollen parent, and the mule has foliage similar to it. The flowers have the bent tube of the *Cyrtanthus*, and spreading segments as in the male, while the colour is variable

in different seedlings. Some doubts are thrown on the parents, as to whether they constitute distinct genera; but the same uncertainty is applicable to *Lapageria rosea* and *Philesia buxifolia*, the parents of *Philageria Veitchii*. The progeny is sufficiently unproductive and difficult to flower to warrant the belief in a wide separation of the sexual relationship of the parents. Amongst the *Amaryllidaceæ* we have a hybrid between *Hymenocallis* (*Ismene*) *amancæs* and *Elisena longipetala*, whose distinctness is sufficiently well authenticated. *Calanthe Veitchii* is a hybrid between *Limatodes rosea* and *Calanthe vestita*, but the parents are not reckoned good genera.

With respect to bigeneric crosses amongst Orchids Mr. H. J. Veitch says, "Leaving the progeny derived from species of *Cattleya* and *Lælia* out of consideration, the last-named genus being confessedly an artificial one, only two bigeneric hybrids have yet flowered; these I have mentioned above—*Phaius irroratus* and *P. i. purpureus*. Many years ago Dominy raised *Anæctochilus Dominii* from *Goodyera discolor* and *Anæctochilus xanthophyllus;* and *Goodyera Veitchii* from *Goodyera discolor* and *Anæctochilus Veitchii*. Plants derived from both crosses are still in cultivation, but the names they bear are simply garden names. We have plants, but which have not yet flowered, raised from *Cattleya Trianæ* and *Sophronitis grandiflora*, and *C. intermedia* crossed with the same species of *Sophronitis*. We have beside a seedling whose parents are *Cattleya Trianæ* and *Brassavola Digbyana*, but as the last-named is now referred to *Lælia*, this can hardly be regarded as a bigeneric cross."

II. **The Intercrossing of Varieties.**—Leaving for the present the question of selection, to review that of the intercrossing of varieties, we enter an unbounded field of useful labour, where, with the experience of those who have preceded us, anything inside the limits of natural laws can be accomplished by the hands of the experienced and intelligent hybridist. Were our leading horticulturists to tabulate their experiments and results with the accuracy and precision of a Darwin, the leading and salient features of the handicraft would certainly be grasped and reduced almost to the value of a science. With good material in hand out of which to manufacture new varieties inheriting the good properties of both parents, there is almost unlimited scope for improvement on the original. Healthy plants only should be operated upon, and the hybridist having profited by the experience of his predecessor, in the case of flowers would apply the pollen from a plant of the desired colour to the pistil of another possessing the desirable habit or size of flower. Other desirable properties could be added by operating on the progeny, and this is frequently the only method of obtaining varieties worth perpetuating. When it is desirable to operate on widely-distinct varieties, the first results may not only be unsatisfactory, but highly disappointing. By perseverance, however, and intercrossing the offspring of these same varieties, the most encouraging success has attended, and certainly will attend, the labours of the operator.

The truth of the foregoing statements may be grasped in a measure, when we consider what the hybridist has done for the tuberous-rooted Begonias in a comparatively few years. The enormous dimensions of the flowers, together with the delicacy and intensity of colour that have been infused into them, with endless and varying tints, would scarcely be credited by one of the old school, who has been accustomed to years of patient waiting and tedious selection. The parents of this race, *B. Boliviensis*, *B. Veitchii*, and *B. rosæflora*, are closely-allied species, and no doubt good in themselves, but neither they nor their first resulting progeny are at all comparable with the magnificent sorts now existing in hundreds, named or nameless. *B. Pearcei*, another parent of this group, with yellow flowers, hybridises readily with the scarlet species, or their progeny, but the first result is a mass of rubbish that would require several successive generations of seedlings to obtain anything desirable. Remembering the axiom that "*natura non facit saltum*," we should, for immediate results, adhere to the intercrossing of already improved forms of closer relationship.

Parallel with this we have a showy race of flowers popularly known as Gloxinias, but which are really Sinningias, and mostly descended from *S. speciosa*. After some years of domestication, during which the original progenitor or progenitors have been induced to vary, the extent to which this may afterwards be carried is almost unlimited. The original shape of the corolla was tubular, widened upwards, with a ridge along the upper side, and nodding. By intercrossing the different varieties, the original has been induced to break into sorts that readily reproduce themselves from seeds, having erect, nearly regular, campanulate corollas, most beautifully spotted, or transversely banded, with the most delicate, or intense and distinct, zones of colour. This is a striking proof that these artificial productions of man require his constant attention for their preservation, inasmuch as the upright varieties, if left to the keeping of nature, would neither afford the proper adaptations for insects, nor preserve the pollen from rain. However, they are highly ornamental subjects for our green-houses, and if propagated by intercrossing the best varieties, a most varied and beautiful stock may readily be obtained.

The varieties of the garden Pansy are believed to be the descendants of *Viola tricolor* intercrossed with *V. Altaica*, *grandiflora*, and *lutea*. There has been great controversy as to whether such is the case, and whether the so-named forms are varieties of one species. With regard to the last, it is immaterial whether we regard them as species or not, seeing that centuries of domestication have effected marvels in breaking down barriers at one time believed impassable. Again, in a state of nature we find *V. tricolor* extremely variable as to colour in different parts of the country, so that within this species itself we have all the material necessary for the manufacture of a practically unlimited amount of forms, which we have merely to improve by intercrossing and selection. The greatest first victory obtained was a variety in which the distinct lines on the base of the lower petals had broken into a decided blotch. For garden decoration the size and intensity of colour infused into the small, pale blue, Pyrenean *V. cornuta*, is simply marvellous, but not more so than that of many of the huge modern representatives of *V. tricolor*, several times the size of the original.

The unnatural conditions brought about by cultivation and artificial intercrossing are well illustrated in *Primula Sinensis*, the garden forms of which are rapidly becoming self-fertile, by fertilising varieties with their own pollen in order to perpetuate the colours. Naturally, this species, like most of the genus, is dimorphic; that is, one individual has a short style, with stamens seated at the mouth of the corolla; while another has a long style, with the stamens inserted low down the tube of the corolla. The forms are about equally distributed, and the most legitimate union is formed by fertilising the long-styled form with pollen from the stamens seated at the mouth of the corolla, and *vice versâ*. By so doing, a progeny with a stronger constitution, and more prolific in seeds, is the result. The object of the florist, however, in labouring to produce flowers up to his ideal standard, has a tendency to obliterate many natural habits, however constant in a state of nature.

All the European varieties of cultivated Grapes have been obtained from *Vitis vinifera*, of which there are several more or less distinct varieties in a wild state. It has been crossed, however, with the American *V. labrusca*, but that does not concern us at present. In order to obtain new sorts, owing to the special adaptation for self-fertilisation in the Vine, and the prepotency of the pollen of a variety in preference to that from another, it is necessary to take great precautions in order to insure that cross-fertilisation shall take effect between two varieties artificially impregnated. This does not imply that varieties do not vary (although they are pretty constant) unless carefully and artificially crossed, for we have an instance on record that a golden-coloured variety has been raised in England from a black one which had no chance of being cross-fertilised, and Van Mons of Belgium raised a multitude of varieties from one Vine, presenting great variation. The flowers to be fertilised should be covered some days previous to their expansion with a muslin bag, to prevent the access of insects or foreign pollen, and operated on in the manner previously detailed All this should be accomplished in the early part of the day, while the sun is shining. As in the case of many other fruits or flowers, the most valuable sorts have been obtained by successively interbreeding the progeny of the first results.

Amongst Apples and Pears it may seem impossible to obtain anything more distinct from the many excellent varieties under cultivation; but much may yet be done in raising varieties better able to endure spring frosts. Artificial cross-fertilisation, if conducted with scientific accuracy, can effect great achievements. Instead of leaving it to the chance work of insects and other natural agencies, the hybridist, having certain ends in view, will select parent plants possessing the desired properties, by the union of which he expects to attain his object. The flowers produce honey, which, in conjunction with the showy wide-open petals, offers great attractions to bees and other insect visitors. Therefore the flowers to be cross-fertilised should be properly protected from the introduction of other pollen, by whatever agency, in order to insure the accuracy of the experiment. Their own stamens should be removed before the pollen is shed, lest the pistil should exhibit an elective affinity for its own in preference to foreign pollen.

What applies to Apples and Pears will answer equally well with regard to Peaches, Nectarines, Apricots, Plums, and Cherries, popularly known as stone-fruits.

Lathyrus odoratus, the Sweet Pea, and *Pisum sativum*, are two remarkable instances of plants belonging to the *Leguminosæ*, with showy flowers, well adapted for cross-fertilisation, but which are, nevertheless, almost invariably self-fertilising in a state of cultivation. Both are exotic plants, and very little frequented by insects in this country, the common honey-bee being, however, partial to the first, a very important fact for the seed-growers, who can cultivate the varieties in close proximity to one another without danger of intercrossing. In proof of this, varieties of the Garden Pea, raised by Mr. Andrew Knight, from cross-fertilised sorts, and cultivated for sixty years, retained a vigorous constitution, and reproduced themselves true to name. Furthermore,

when insects are rigorously excluded, the flowers are equally fertile. Besides obtaining new varieties by intercrossing the best existing ones, the vigour of the progeny is generally improved. Fertilising the flowers of one individual with the pollen of another of the same variety, shows no decided advantage in the progeny; but a marked improvement is observable when two distinct varieties are cross-fertilised. New and desirable varieties, when once obtained, are fixed by selection.

Varieties of the Sweet Pea can be grown in mixture without intercrossing naturally, but the dark-coloured varieties are most prolific in seeds, and therefore tend to out-number the others unless they are occasionally selected.

The Strawberry offers an interesting case in direct opposition to that of the Pea. The pistil is mature before the stamens, so that cross-fertilisation must and does constantly ensue. The various species and varieties occasionally become imperfect, and produce either staminate or pistillate flowers. They are more liable to do so in some soils and climates than others. An acre of Keen's Seedling has been recorded as almost barren, from the absence of stamens. When staminate plants are grown in the immediate vicinity, natural cross-fertilisation of the pistillate flowers is almost a certainty. Chance seedlings of merit may occasionally be obtained from these plants, but the method is too tardy and uncertain for the present generation.

By selecting varieties possessed of desirable properties, such as size, colour, or flavour, the hybridist, according to the ends he has in view, can unite them with others of the desired habit, vigorous constitution, or productiveness. As already remarked, the varieties of Strawberry in cultivation are the descendants of several species, so that the hybridist has abundant material at hand in the way of good and distinct sorts.

The general subject of hybridisation from a gardener's point of view was well treated of by the late Isaac Anderson Henry, whose observations as well as those of other experimenters are well summarised in Burbidge's "Cultivated Plants: their Propagation and Improvement."

III. **Selection.**—At first sight the three headings of this chapter appear more or less decidedly distinct; but on close and searching inquiry, the secret principle underlying the whole, however much obscured, is to a certain extent the same. For instance, that "like produces like," goes without saying, and this may be true in a measure, but if there never were any variation in nature, how could man improve his favourite races of plants by selection? The mere fact of selection does not prevent the natural intercrossing of varieties when insect or other agencies have access to them. By selection alone several fine varieties of Mignonette have been preserved and increased. The flowers of this plant are great favourites with bees, and the pistil of one flower gives a decided preference—that is to say, is specially acted upon by the pollen from a different flower; therefore, what is more probable than that the improved variety is the result of natural intercrossing? To attain a desired end, this process may be a slow one, but by weeding out the undesirable forms, generally called "rogues," success is none the less certain because tardy.

Most of the valuable cultivated varieties of cereals have been obtained by selection, a fact which is all the more remarkable seeing that Wheat, Barley, and Oats are, as a rule, self-fertilising, although they do afford opportunities for a cross. Where the process is rigidly adhered to, the mode of operation is to select not only the largest and best-looking heads, but the plumpest and best-looking grains. However, some experts are of opinion that, to preserve the vigour and constitution of the plant, occasional sowings of the small grains at the base and apex of the ear of Wheat should be made.

It is a remarkable fact that hundreds of the best Apples and Pears that stock our gardens, as well as those on the Continent and in America, have originated as chance seedlings, and of course were selected from amongst countless others, devoid of merit. The difference between this kind of selection and that above mentioned is that a meritorious Apple or Pear, once selected, needs only to be propagated by budding and grafting. The various sorts are the descendants of one species in each case, and originated under all sorts of conditions in the gardens of the wealthy or the poor, as well as in those of the monks of olden times. Hundreds of unnamed varieties exist in this country, that never advance beyond the locality where they originated, a sufficient reason being often found in the fact of their being best adapted to that locality. This is partly accounted for by the parents of such seedlings imparting to their progeny a constitution best fitted to the climate and soil of that part of the country.

In the case of Pears especially, the application of this principle would be of the utmost importance, from the fact of its earlier flowering than the Apple, and greater liability to be injured by spring frosts. The tree was cultivated more than 3,000 years ago by the Greeks and Romans, and it is notorious, notwithstanding the hundreds of cultivated sorts, that our leading and most valuable varieties are of Continental origin. Despite the many centuries of domestication to which the Pear has been subjected, and its great liability to variation when raised from

seeds, many sorts are so far fixed that they readily reproduce the leading characters of their parent races. Dr. Van Mons, of Belgium, has raised numerous good varieties by sowing seeds from successive generations of the same original. He had great faith in his system, and believed that cross-fertilisation tended to bring about degeneracy in the offspring. Notwithstanding his mode of procedure, it will be obvious to every one that unless carried out with scientific accuracy, experiments of this nature are most liable to be frustrated. Pear blossom is so popular with, and open to, a great number of insects, that in the case of unprotected trees it is just possible that every seedling variety of merit he ever obtained was the result of a cross between two distinct varieties. Although the Pear can never become of such national importance as the Apple, the raising of new and meritorious sorts, possessed of earlier fruiting properties, and more capable of resisting the variable climate of our country, cannot be too highly recommended. (See articles on the Apple and Pear).

Some idea of the immense and important changes brought about by the selection and good cultivation of some of our domesticated fruits, can be gleaned by comparing the wild Gooseberry with many of the popular and valuable sorts of garden origin. The average weight of a berry of the wild form would be about 120 grains, while that of a variety called "London" was produced in Staffordshire in 1852, weighing 895 grains. (See Gooseberry.) Probably this is the largest on record, but it must not be supposed that cultivation alone would bring about such marvellous results. Sowing the seed of the best and most promising varieties to obtain new sorts, is a slow and uncertain process, because everything almost is indefinite and left to chance; but such a method of procedure prosecuted for centuries in the case of long-domesticated plants, has resulted in accumulating the innumerable fruits, and so-called florists' flowers, that fill our orchards or adorn our gardens.

Amongst flowers belonging to various natural orders, especially annual species, selection is carried on to an almost unlimited extent, and is, indeed, frequently the only practicable means at command for the production of seeds on a large scale to meet the public wants. Large breadths are sown, and the worthless varieties, or undesirable mixtures, assiduously weeded out; and this being pursued for several successive generations, results in what are called strains, being so far fixed that they can reproduce the desired property, or colour, with tolerable accuracy.

One of the most remarkable cases coming under this heading is that of *Mathiola annua*, the Ten-weeks Stock. A long-selected strain has inherited the faculty of producing individuals with single, and others with perfectly double, flowers. The latter are completely sterile, but seedlings raised from the former generally yield a good percentage of double flowers, and this is the only practicable means of perpetuating the race.

In reviewing the list of popular florists' flowers, it is remarkable what a number of them have been improved, at least in their earlier days of cultivation, simply by selection. This is obvious when we consider that in numerous instances they are the lineal descendants of one progenitor, where the only chance of improvement consisted in diligently selecting individuals that differed from their parent in any slight degree, and breeding with them for successive generations. At the same time it is a notorious fact that some plants take an infinitely longer time before they exhibit much improvement, while others by some unaccountable means rapidly improve under cultivation, and immediately become popular. Amongst the earlier productions, the Tulip, Hyacinth, and Auricula must be grouped here, and, in a lesser degree, Primroses and Polyanthus as descendants of one original, although the latter are generally believed to have a hybrid origin in two species, namely, *Primula vulgaris* and *P. veris*. The Carnation and Pink are the lineal descendants of *Dianthus caryophyllus* and *D. plumarius* respectively, and the number of forms that have originated from each are as surprising as they are popular and beautiful. The same number of beautiful forms possibly are found in *D. barbatus*. But the number of mules resulting from the intercrossing of two species in this genus are remarkably few, as it seems to exhibit a decided aversion to muling.

The varieties of the Chinese *Chrysanthemum Sinense* constitute a monument of achievement as to what can be developed from a single species. The original stock had doubtless been induced to vary by intercrossing selected varieties, and at the present day the numerous forms are readily divided into distinct races or sections, known as the Incurved, Recurved, Anemone-flowered, Pompon, and Japanese Chrysanthemums. We have an almost parallel instance in the China Aster, *Callistephus Chinensis*, where the sections are known as Chrysanthemum-flowered, Pæony-flowered, and Victoria Asters. In this instance, likewise, all are descended from one original species, which implies long and careful selection in the first place, to obtain a diversified stock.

Primula Chinensis, *P. Sieboldii*, and *Cyclamen Persicum*, offer instances of florists' achievements effected within comparatively recent years. The numerous and extremely varied progeny are descended from a

single species in each case, and although they have been cultivated for a considerable number of years in the gardens of this country, the progress made by selection was slow until their improvement was taken in hand by the London nurserymen, who, by the judicious intercrossing of selected varieties, have rendered the original types of at least *Primula Chinensis* and *Cyclamen Persicum* no longer worthy of cultivation alongside their more favoured offspring.

BULBOUS PLANTS.

By William Goldring.

Nemastylus.—These are lovely North American Irids, but as they belong only to the warmer regions, they require protection and care. There are three species, the best known being *N. acutus*, called also *N. geminiflora*, having large lilac-blue flowers; the others are *N. purpureus*, and the beautiful *N. cœlestinus*, which has large sky-blue flowers.

Nerine Fothergilli.

Nerine.—A beautiful genus comprising some of the most desirable of all bulbous plants. There are only about a dozen species, but the varieties are numerous. They are all Cape of Good Hope plants, therefore are tolerably hardy; some, indeed, such as the well-known Guernsey Lily (*N. Sarniensis*), may be grown successfully in the open air in the warmest parts of the country. One of the chief points of value in the *Nerines* is that they generally flower throughout the autumn. The colour ranges from the most brilliant scarlet through roses and pinks to the most delicate blush tints.

The Guernsey Lily (*N. Sarniensis*) is the type of the numerous sorts grown in gardens. The foliage is deciduous, and the flower-spikes are terminated by a dense head of erect flowers, varying a good deal in colour, and on account of the difference in colour they have received distinct names. In *Sarniensis* itself the colour is a deep rose-pink. It flowers in September, in company with the Belladonna Lily. The following sorts, all varieties of *Sarniensis*, are the best grown in gardens:—*corusca*, bright vermilion; later than *Sarniensis; Fothergilli*, bright crimson-red, flowering in September; *Plantii*, cherry-crimson; *curvifolia*, *atrosanguinea*, and *venusta*, the latter a splendid variety, which flowers after the others, and extends into November. There are several others, such as *Meadowbankensis*, that are rarer, but none the less beautiful. Then there is another group less showy, but very pretty and of graceful growth. Among these are *N. amabilis*, *crispa*, *flexuosa*, *humilis*, *pulchella*, all of which belong to a distinct group, having smaller and differently-shaped flowers from the *Sarniensis* type.

Culture.—One, at least, of the species, viz., *N. Sarniensis*, the Guernsey Lily, may be grown and flowered successfully in the open air, in the southern parts of the country, and it happens that it requires exactly the same treatment as the Belladonna Lily (*Amaryllis Belladonna*), which has been given in a previous chapter. The two plants flower at the same time; they make their growth and ripen at the same time, and require to be planted together. Pot-culture of *Nerines* in green-houses or frames is simple, if a few rules are observed. Unlike a good many bulbs, the majority of the species make their growth during winter, when other bulbs are resting; consequently this leads some into error who try to force the plants into rest, instead of maintaining them in vigorous growth. The foliage is developed fully by the spring, and after this shows signs of decay, the plants should be kept warm and dry until August or September, when the

flower-spikes begin to appear. By this time the soil will have become perfectly dust-dry, therefore the plants should be well saturated with water, after which the flower-spikes make rapid growth. As the spikes attain their full size in September, the foliage begins to push up, and from that time onwards till the spring, the plants must not be allowed to become dry, but care should be taken to maintain the foliage in good health. If the pots are full of roots, and the plants vigorous, an occasional dose of manure-water may be given. This will assist the plants much. It must be remembered that *Nerines*, like a good many other bulbs, thrive best when pot-bound, therefore the plants should not be re-potted until the pots become so full of bulbs as to be unduly crowded. Potting should be done after the flowering season is just past, then the plants will have plenty of time to fill the pots with roots before the spring. The soil should be good, two parts of loam, one of sand, one of manure, and one of leaf-mould. The plants should be potted firmly, one good-sized bulb in, say, a 4½-inch pot. *Nerines* propagate themselves rapidly, and one bulb will soon fill a good-sized pot with its offspring. The bulblets should be separated at potting-time. A good place to grow the bulbs in is a brick pit, which can be sufficiently heated in winter to keep out frost. This is all the heat necessary. Full exposure to the sun during summer, with the lights on, will ripen the bulbs, and when the plants are in bloom they may be taken into the green-house, where they would remain in perfection for several weeks during September and October.

Ornithogalum (*Star of Bethlehem*).—A numerous genus, containing but few species worthy of attention. Some are quite hardy, others require green-house culture, and among the latter are some extremely beautiful plants. The species vary a good deal in stature, but there is a great resemblance among the various kinds. All produce their flowers in clusters, on short or tall stems, and are generally white.

The hardy kinds are chiefly natives of Europe. The most desirable to cultivate are *O. comosum*, *exscapum*, *Narbonnense*, *latifolium*, *nutans*, *pyramidale* (one of the best, its flower-stems being a yard high, surmounted by dense flower-clusters), *O. umbellatum*, the common Star of Bethlehem, and *tenuifolium*. These all have white flowers, and are of the simplest culture, thriving in any common light garden soil in any position. *O. umbellatum* is a capital plant for planting in masses in the rougher parts of the garden; and *O. nutans* is particularly well adapted for naturalising where the soil is light. Its flowers are not showy, being greenish-white, but they are elegantly borne on nodding stems. They may be all propagated by bulblets and seeds.

The green-house kinds are valuable plants. There are three species worth attention; these are *O. Arabicum*, *aureum*, and *thyrsoides*. The first has tall spikes of flowers, about an inch and a half across, pure waxy-white, with black centres. *O. aureum* is a dwarf grower, with large flowers, of a rich golden-yellow; and *thyrsoides* is similar to *Arabicum*, but its flowers are pure white. These are excellent for pot-culture, and as they flower in summer, they are of considerable value in the green-house. Ordinary light potting-soil will do for them, and three or four bulbs may be put in a 6-inch pot. *O. aureum* is a scarce plant, but the other two are plentiful and cheap. They should be procured in autumn and potted at once, or kept till spring. Some grow the two white kinds in frames with other Cape bulbs.

Pancratium.—Nearly allied to *Hymenocallis*, previously described; indeed, the two genera are commonly confused, so much do the species resemble each other. The *Paneratiums* are natives of tropical and sub-tropical countries in various parts of the world, not confined, as *Hymenocallises* are, to tropical America. For instance, some are natives of South Europe and North America, as well as Asia. There are about a dozen species, several of which are in cultivation. All have beautiful white flowers, mostly large and fragrant, produced in large clustered heads on short stems, rising above the foliage, which is often broad, handsome, and evergreen. One of the best known tropical species is *P. Zeylanicum*, a beautiful plant from the East Indies. It has large bulbs, broadish evergreen leaves, and large, white, and very fragrant flowers.

The hardier kinds are natives of North America and South Europe. Among those is *P. Illyricum*, of dwarf growth, with narrow leaves, and bearing clusters of large white flowers on stems about a foot high. It is a native of South Europe, and may be grown either in pots in green-houses, or in a warm border. *P. maritimum* and *parviflorum*, also South European plants, are similar, their white flowers being deliciously fragrant; and *P. Carolinianum* and *occidentale*, both natives of sea-coast regions of the southern States of North America, are worth attention.

Culture.—The tropical species of *Paneratium* may be grown under precisely the same conditions as recommended for *Hymenocallis*. The half-hardy kinds may either be grown in a frame or green-house in pots, or in warm sunny borders, well drained and raised above the level. In southern districts these out-of-door bulbs may be left out during the winter if protected from frosts by mulching, but in colder

localities they should be lifted in autumn and kept through the winter. If the bulbs are planted at the foot of a warm south wall, they frequently require no further attention. The best soil for the hardier kinds is a sandy loam, and the bulbs should be planted several inches in the border.

Pentlandia miniata.—A pretty Peruvian bulb, tolerably hardy, but requiring green-house culture. It is a small-growing plant, with slender flower-spikes of bell-shaped flowers of a bright orange-red colour. It thrives in company with such as *Stenomesson* and *Phædranassa*, and flowers during the early part of summer.

Phædranassa. — Amaryllidaceous plants, natives of tropical America, and allied to *Clivia*. One of the three species, *P. chloracea*, is very handsome. It has large leaves of a deep green. The flower-stem rises erect for about two feet in height, bearing an umbelled cluster of from six to eight drooping tubular flowers of a brilliant red, tipped with deep green. It flowers in early summer, generally about May. This description applies to the typical form, but there are other inferior varieties of it, poorer in colour, such as those named *rubro-viridis*, *multiflora*, and *obtusa*. They are all natives of tropical America, chiefly in the Andes of Peru, and may be successfully grown in an ordinary close green-house, treated in the same way as *Ismene* and such-like genera.

Pancratium Caribbæum.

Phalocallis plumbea.—This Brazilian bulb (known also as *Tigridia cœlestis* and *Cypella plumbea*) is a curious plant, but not showy, and therefore only worth growing in a botanical collection. It requires to be treated like *Tigridias*.

Placea.—A small genus of Chilian plants allied to *Pancratium* and *Elisœna*, but only a few species are in cultivation. Among these are *P. Arzæ* and *P. ornata*, both pretty plants. The flowers of both are about two inches across, in form like those of a *Nerine*, but at once distinguished from that genus by the narrow tube-like corona. In *ornata* they are white, tipped with red; while in *P. Arzæ* they are white, with longitudinal streaks of red. They thrive under the same conditions as *Elisœna* and *Ismene*.

Plagiolirion Horsmanni.—This plant resembles the *Eucharis*, but is not so attractive in its flowers, which are white; produced during summer. The same treatment as for *Eucharis* suits it.

Polianthes tuberosa (*Tuberose*).—This lovely and popular bulb is a native of the tropics of the East Indies. The wild form is, of course, single-flowered, pure white, and deliciously fragrant, but the most popular for cultivation are the double varieties. The culture of Tuberoses has developed quite an industry in New Jersey, in Algiers, and various parts of Italy, and the produce from these countries are known variously as American, African, and Italian varieties. The African bulbs arrive here about September, and these are bought for supplying an early crop of bloom. The American and Italian bulbs arrive about Christmas time, and these form a succession to the African. As soon as the bulbs are received they should be potted in good soil, consisting of two parts of fibrous loam, one of sand, and one part each of leaf-mould and pulverised cow-manure. The bulbs should be potted firmly, the strongest singly, the smallest three in a 6-inch pot. The pots should be plunged in a gentle hot-bed at first, as Tuberoses dislike hard forcing, but when in full growth a temperature of from 70° to 80° may be given. The bulbs should have plenty of water, and occasional doses of weak manure-water will assist them. They must be well ventilated, or the growth will become

drawn and weak. After the flower-spikes have developed the plants may be taken to a green-house or Vinery, as a cooler temperature preserves the flowers. By potting in September a continuous succession of flowers may be had from about December till May, the latest supply being from the Italian or American bulbs potted about the beginning of the year. In February or March bulbs may be either planted out in frames, or the pots placed in a cold frame, and these plants will flower from about May till Midsummer, and some bulbs may be planted in the open border in June. Tuberoses, in fact, may be successfully grown under cool treatment during spring and early summer, and excellent flowers have even been produced on warm borders in the open air. A good spike will produce on the average about fifteen flowers, and these, as a rule, are picked off separately, and used for button-hole bouquets, as the flower-buds expand in succession. It is useless to attempt to propagate the Tuberose in this country, as the bulbs do not mature, and they are rarely of any use for a second yield of bloom, therefore rub off any bulblets attached to the bulbs when received. The sorts grown are called Double Italian, Pearl, and Double African. There is also a variegated sort.

Puschkinia scilloides. — A pretty spring-flowering bulb, resembling some of the *Scillas*. The flowers are a delicate blue, with a dark blue stripe down the centre of each petal. In the variety *compacta* the flowers are more dense. It is sometimes confused with the little *Chionodoxa nana*, and other names for it in gardens are *P. Libanotica* and *P. sicula*. It flowers in March or April, is perfectly hardy, and is a native of Asia Minor.

Rhinopetalum Karelini.—A plant allied to *Fritillaria*. It is dwarf, and bears bell-shaped white flowers, mottled with pink and red. It blooms in spring, and requires pot-culture in frames. Native of Central Asia.

Rigidella.—Half-hardy bulbs, and requiring frame or green-house culture. There are two species in cultivation—*R. flammea* and *R. immaculata*. The flowers of *flammea* are a brilliant scarlet. *R. immaculata* is less showy. The bulbs may be either potted in autumn or kept in sand till March.

Romulea (*Trichonema*).—A small genus of Iridaceous plants, all of small growth. There are about half a dozen kinds in gardens, the commonest being *R. bulbocodium*, a native of South Europe. It has grassy foliage, and flowers like a Crocus, of a bright rosy-lilac; similar to it are *Clusii*, *ramiflora*, *rosea*, and *Columnæ*. The best way to grow these miniature plants is in a raised warm border facing south, open to the sun, and so arranged that at any time they may be protected. A sandy loamy soil suits them, but the border must be dry and well drained.

Schizostylis coccinea.—This is a pretty South African plant, flowering in late autumn, when open-air flowers are scarce. It resembles *Gladiolus* in growth, and when well grown produces flower-spikes a yard high. The flowers are a bright crimson. In the Southern counties it is perfectly hardy in the open borders without protection, but in Midland and Northern districts it does not generally thrive well in the open air unprotected. When grown out of doors it likes a light loamy soil, and an open sunny situation, if at the foot of a south wall the better. It is often grown in pots for green-house decoration, for which purpose the plants, after being wintered in frames, are planted out in May in an open border of good soil. By the following September the plants will have grown into nice tufts. These should then be lifted and potted, and taken to a frame or green-house. They will begin to flower, and remain in bloom for several weeks. It may be readily increased by division in spring. A native of Kaffraria and Natal.

Scilla (*Squills*).—The Squills flower at a time when nature has scarcely awakened from her winter torpor, and their neat growth and glowing cœrulean hues of their flowers render them very charming. The hardy *Scillas* are natives of Europe, chiefly found in the central and southern parts, whereas the majority of the tender species are natives of South Africa. The following list comprises a selection of the species best suited for general cultivation:—

S. amœna — flowers about three weeks later than the Siberian Squill. It is dwarf, tufted in growth, and a profuse flowerer. Flowers are an inch across, of a dark indigo colour, with pale centre. Native of the Tyrol.

S. bifolia—one of the earliest harbingers of spring, generally flowering before winter is gone. In the type the colour is a rich turquoise-blue, but there are numerous forms—white (alba); pink (carnea); rose (rosea); pale blue (pallida); and besides these there are some differing in size—for instance, maxima, the largest; præcox, the earliest; and Taurica, the finest of all, both in point of size and colour. In the choice border or rock garden, this Squill should always be found, and it thrives well in any warm light soil.

S. campanulata (Spanish Squill) — this is a later flowerer than bifolia and Sibirica, and others, and is in perfection in May and June. It is a vigorous grower, like a magnified form of the Wood Hyacinth or Blue-bell. The type is blue. Then there are white, pink, rose, pale blue, and dark blue, and some are large and called maxima varieties. It grows from twelve to eighteen inches high, and is an excellent plant for the mixed border, shrubbery margin, or wild garden. It is also called S. Hispanica.

S. Italica is a small kind; flowering in early summer. It is pale blue. S. autumnalis may be classed with this species, and S. verna also.

S. nutans—the common Blue-bell or Wood Hyacinth—has many beautiful varieties, none so lovely as the pure white, which is one of the best of all hardy bulbs. There are also white, pink, and very deep blue sorts—all good. S. patula, S. cernua, are names by which the forms of this species are catalogued.

S. Peruviana may be taken as the type of several species and varieties, having a tuft of broad foliage, and producing large and dense clusters of flowers in summer, varying from blue to rose, and white. These are noble plants when well grown, but they only acquire perfection in warm light soils. The names Cupanii, ciliaris, Hughii, and others, belong to the same group, all being natives of South Europe. S. Peruviana is a misnomer, the plant being European, not a Peruvian plant.

S. Sibirica — perhaps the most popular of all the Squills—is the earliest to bloom, and its deep blue flowers are welcome in spring, either out of doors or in the green-house, for happily it may be grown to perfection in pots. This is the hardiest of all, and withstands rain, wind and even snow, remaining a long time in bloom.

Among other *Scillas* to be found in gardens in open borders are *Lilio-hyacinthus*, *hyacinthoides*, and *amethystina*, but these are only suitable for collections. There are numerous tender kinds, but they are not worth pot-culture.

Culture.—The hardy *Scillas* are all of simple culture, and are not at all fastidious as to soil or position, as they thrive in sun or shade, in light soil or in stiff. They grow, however, to the greatest perfection in a warm, deep, sandy loam, in an open yet sheltered situation. *S. bifolia* deserves the sunniest border in the garden, and so does *Sibirica*, but being hardier, it will grow anywhere. The Spanish Squill and the Blue-bell varieties thrive in shade or sun, and if fine spikes are required they must be liberally treated, that is, the soil should be well enriched. The bulbs should be planted in autumn, moderately deep so as to be out of harm's way of severe frost. After being once planted well, they should not be disturbed for at least three or four seasons. *Scillas* look well anywhere, whether it be in lawn-beds, on margins of shrubberies, rockeries, or by woodland walks. *S. Sibirica* is commonly forced into early bloom, as early even as Christmas, if treated like Hyacinths and Tulips.

All the Squills are increased by separating the bulblets at lifting-time.

Sparaxis.—This genus, like the *Ixia*, *Babiana*, and *Tritonia*, comes under the general term of Cape bulbs, all being nearly-related members of the great *Iris* family, and require much the same cultural treatment. Although the varieties of *Sparaxis* in catalogues are so numerous, the genus is really a small one, there being but three species. The first is *bulbifera*, rather an attractive plant, but not so handsome as the other two, *S. grandiflora* and *S. tricolor*. From these the numerous varieties have sprung, and even of wild varieties described by botanists there are some half a dozen forms. *S. grandiflora* has large open flowers about two inches across, and most richly coloured with yellow, deep rose, and deep crimson, and *tricolor* is similar. The following dozen sorts comprise a good collection :—

Alba, white.
Amelina, pale yellow.
Bulbifera, deep yellow.
Delicata, yellow.
Garibaldi, crimson and yellow.
Josephina, white and yellow
Lady Carey, white, blotched with purple.
Lutea, sulphur-yellow.
Maculata, white, purple, and yellow.
Pavonia, white and deep purple.
Tricolor, scarlet, marbled with crimson.
Victor Emanuel, red and yellow.

S. pulcherrima.—This plant is very different from the others, and though it is commonly called a *Sparaxis*, it strictly belongs to the genus *Dierama*. It is, indeed, a beautiful plant, one of the most remarkable of all bulbs, and different from all other plants. It has leaves like an *Iris;* its flower-stems are very slender, and from five to eight feet high, and rise in a gracefully arching manner like the tall stem of a Grass. The flowers are like bells, about two inches in length, and these droop prettily from the stem at intervals of a few inches; the usual colour is rose-purple, but there are deeper and very much paler varieties. It lasts a long time in flower during the summer months. Though a Cape plant, it may be grown in the open air with us, provided it is planted at the foot of a warm south wall, in a light well-drained soil, in autumn, and protected during winter. *S. Thunbergii* is not so attractive.

Sprekelia formosissima (*Jacobean Lily*).—This handsome Amaryllis-like bulb is known in gardens under the name of *Amaryllis formosissima*. In early summer, usually about May, it sends up its flower-stem before the leaves. The stems are about a foot high, each bearing a curiously-shaped flower some six inches across, having spreading narrow sepals of a deep crimson. It is highly attractive in flower, and endures a considerable time in beauty. After flowering it develops its leaves, and when these are perfected the bulbs require to be thoroughly ripened, and afterwards lifted, or otherwise kept dry till spring. The bulbs are procurable in autumn, and may be potted at once, and kept dry, or preserved in sand during winter, when they may be potted about February or March, but still kept dry until flower-stems appear, about a month afterwards. It may be obtained in flower several weeks before the usual time by gently forcing the bulbs, and these forced bulbs will flower again in autumn after perfecting their growth if planted out. The bulbs of *Sprekelia* will also flower readily if placed in glasses in rooms as Hyacinths are. They may be planted out afterwards to perfect their growth. It is hardy enough to bear being planted out of doors, and bulbs

planted out in May will flower well during the summer. The bulbs should be lifted again in autumn about October, and kept in sand, or otherwise dry. The kinds known as *S. ringens*, *glauca*, and *longipetala* are but varieties of *S. formosissima*, differing from it only in colour or size. The *Sprekelia* is a native of tropical America, chiefly Mexico.

Stenomesson.—This is a small genus allied to *Coburghia*. The most desirable species are *S. flavum*, yellow; *croceum*, reddish-yellow; *coccineum*, deep red; *curvidentatum*, yellow; *Hartwegii*, reddish-yellow; and *suspensum*, a pretty plant, with drooping bright red flowers. In all the flowers are tubular, borne on stems produced well above the foliage. Grow with *Coburghia* and *Phædranassa*.

Sternbergia.—The well-known *S. lutea*, also called *Amaryllis lutea*, is an autumn flowerer, and, being very hardy, thrives in almost any kind of soil or situation. There is a narrow-leaved variety of it (*angustifolia*), and one with double flowers (*flore-pleno*), both of which, however, are scarce in gardens. Other cultivated *Sternbergias* are *S. colchiciflora*, a native of Hungary, also with bright yellow blossoms, in the way of *S. lutea*; *S. Ætnensis*, a small-growing plant, with pale yellow blossoms; *S. Clusiana*, producing pale yellow flowers in autumn.

Synnotia bicolor.—A Cape bulb of little importance. *S. galeata* and *variegata* are also in cultivation.

Syringodea pulchella.—A rare and pretty little South African plant, much resembling a Crocus both in growth and flowers. The flowers are of a pale lilac, striped with purple. It may be grown with other Cape bulbs.

Tecophylæa cyanocrocus (*Chilian Crocus*).—A most beautiful spring-flowering plant from Chili. It is dwarf, and the flowers are of an intensely deep blue, pencilled in the centre with white. In the variety *Leichtlini* the flowers are wholly white in the centre, and in both forms are deliciously fragrant. The plants require to be kept cool, and must have abundance of air, but the lights must not be removed from the frame altogether until May, when the bulbs must have plenty of sun to ripen them. Another species, *T. violæflora*, has smaller and less attractive flowers.

Tigridia Pavonia (*Tiger Flower*).—There is not a more gorgeous bulbous plant than the Mexican Tiger Flower. It has been introduced to our gardens for nearly a century, and still it is new to many. It flowers in August and September. The flowers are short-lived, but as numbers are produced one after the other from the folds of each stem, their fugacity is in a measure compensated. The flower-buds prepare to burst during the day, and early next morning they begin to unfold, till about nine o'clock they are in their gorgeous array of scarlet-crimson, spotted with reddish-brown and golden-yellow. This opening and fading of the flowers continues till the flower-spathes are exhausted. Buds will expand in water if the stem is cut the day previous, and placed in water at once. The foliage, too, is handsome, being of a bright green, and beautifully plaited. There is only one species of *Tigridia* with large flowers, but there are several varieties, the most remarkable being the white (*alba*), a new acquisition. The flowers are white, spotted in the cup-like base with crimson. Then there is a variety called *grandiflora*, which has larger flowers than the type. *Wheeleri* also is an improvement upon the original, and *splendens* is remarkable for its intensified colour.

T. conchiflora, or *Canariensis*, as it is also called, is like *T. Pavonia* in form of flower and growth, but is smaller, and the colour is a rich yellow, spotted with crimson-red. The variety *aurantiaca* differs but little from *conchiflora*, if indeed it is not identical. There are some half a dozen other species of *Tigridia*, but they are either rare or not worth attention.

Culture.—In the Southern counties the Tiger Flower flourishes in the open air, and indeed in the favoured parts of Devon and Cornwall it is treated as a hardy perennial. As a general rule, however, the bulbs require to be lifted every season, preserved through the winter, and re-planted in the spring, about the end of March. The best way to winter the bulbs, if they are taken up, is to lift a good deal of soil around the bulbs, place the whole in shallow boxes, and keep moderately dry in some light cool place out of the reach of frost. They must not be kept too dry, or the bulbs will become weakened. If left in the ground all the winter they must be protected. The most suitable soil is a deep sandy loam, which should be enriched by manure when being prepared for the bulbs in spring.

Trichonema. (See Romulea.)

Triteleia.—This name is variously applied. In some catalogues a few of the *Brodiæas* and *Millas* will be found under *Triteleia*, but in most cases the second, or specific name, is a guide to identify the plant. Strictly there are but two *Triteleias* in

gardens. These are *T. uniflora* and *T. alliacea*, both natives of South America, and both pretty out-door bulbs. There is a bulb, however, which goes so generally by the name of *Triteleia*, though properly a *Brodiæa*, that it is well, for convenience sake, to mention it with the *Triteleias*. This is *T. laxa*, a beautiful Californian plant, also grown as *Seubertia laxa*. It is a slender-growing plant, bearing erect flower-stems a foot or more high, terminated by an umbel-like cluster of bright purple flowers. There are various forms of it, differing chiefly in colour and size. These are *Murrayana*, *major*, *maxima*, *atropurpurea* (dark purple), *alba* (white), and *rosea* (pink). It is therefore a valuable plant, and deserves good attention. It thrives to perfection in any open sunny spot; a warm border near a sunny wall being the place it likes best. The soil must be light and sandy, and it is advisable to cover the bulbs in winter with fern, or some kind of mulching. The bulbs may be planted in September or October, at not less than three inches deep. Some grow it admirably in pots under frames, and take the plants when in flower to the green-house. It may be increased by bulblets or seeds.

T. uniflora is a valuable plant, as it flowers out of doors even before winter is past. It is a dwarf free-flowering plant, producing starry flowers, and varying from white to porcelain-blue in the variety *lilacina*. *T. alliacea*, also called *Leucocoryne*, is an inferior plant.

Tritonia.—This is a brilliantly-flowered genus of Cape bulbs, and allied to *Ixia* and *Babiana*. There are only about nine species, but these have yielded a large number of varieties. They resemble the *Sparaxis*, the form and size of the flowers being much the same in both genera, but the colours differ, for while in *Sparaxis* the flowers are mostly parti-coloured, in *Tritonia* they are chiefly self-coloured. They possess a wide range of brilliant as well as subdued tints, varying from the brightest orange-scarlets to quiet blush tints and whites. The principal species are: *T. crocata*, which has large open flowers of a bright orange; the names of varieties *purpurea*, *sanguinea*, *coccinea*, *aurantiaca*, indicate the colours of the flowers, and these are to be found under popular names in bulb lists. *T. miniata* has brick-red flowers, and is very pretty. *T. hyalina*, or *fenestrata*, as it is more commonly called, has the flowers beautifully netted, and so has *T. squalida*. The other species are not particularly attractive. There are about a dozen kinds in bulb lists, all of which are pretty, and among them may be found all the original species and varieties introduced a century ago from the Cape. The names of the best are *amœna*, *Bella*, *Brilliant*, *crocata*, *Eclair*, *elegans*, *fenestrata*, *speciosa*, and *squalida*. *Tritonias* require the same treatment as *Ixias*, *Babianas*, and other Cape bulbs, and the showiest kinds, such as *T. crocata*, are particularly valuable for pot-culture for conservatory decoration in spring.

Tulbaghia violacea.—An elegant little hardy Cape bulb, requiring aquatic treatment. It bears slender flower-stems, terminated by dense clusters of about a dozen small violet-purple flowers.

Tulipa (*Tulip*).—Familiar as the common garden Tulips must be to every one, the wealth of the genus as a whole is comparatively little known. There are upwards of fifty species known to botanists, but only about a dozen of these are known generally. The numberless varieties of garden Tulips have sprung from very few species, and these have been in cultivation for generations. Among these wild Tulips, which, on account of their extreme beauty, are worthy of mention here, are: *T. Celsiana*, a small-growing plant with bright canary-yellow flowers, produced in the early part of May. *T. Clusiana*, a lovely plant of humble stature, having smallish flowers of pure white flushed with rose-pink. Being a native of South Europe it needs protecting in the winter. Of similar appearance, and as hardy, is a North Indian species, *T. stellata*, so beautiful as to merit culture. The flowers are large, white, and of beautiful form. *T. cornuta* is a distinct-looking plant with narrow twisted petals. *T. Greigi* is the noblest of all Tulips, and one of the most gorgeous flowers in nature. The blossoms are often six inches across, of an exquisite cup-like form, and of the most brilliant scarlet imaginable, spotted with black. It is quite hardy, and thrives in ordinary soil in a warm sunny border, but its extreme beauty entitles it to be grown as a pot plant in frames. A native of Turkestan. These comprise the very best of the wild Tulips, but the following species are well worth growing, being very showy, and are mostly different from the common garden sorts. These are *T. Altaica*, *Australis*, *biflora*, *carinata*, *elegans*, *fulgens*, *Haageri*, *Kolpakowskiana*, *maculata*, *oculis-solis*, *Persica*, *retroflexa*, *saxatilis*, *sylvestris*, and *triphylla*. It is a good plan to grow these species of Tulips in a bed by themselves, which should consist of light soil, and be drained. They do not require lifting every season, but about every third season, and at the time of lifting the offsets may be separated for increasing the stock.

Garden Tulips.

These may be classed under two heads, early and late flowerers. The first group comprises the sorts which flower in early spring naturally, and which may be forced into bloom in midwinter. The late

flowerers bloom in May. The early race are descendants chiefly of *T. suaveolens*, *T. præcox*, and others, and embrace a wide range of varieties, which are of great value in the garden. These early kinds may be divided into two sections: Van Thol, or earliest flowering, which comprise a dozen or so good sorts, while the rest fall under the second section, which include rose, scarlet, white, and yellow sorts. The Van Thols are best adapted for early forcing, and one of the best of the few varieties is bright scarlet, which is forced by the thousand for the London market. It is equally suitable for open-air culture, being a hardy sort.

A good selection of a dozen from the later single sorts include :—

Bruid Van Haarlem—white and crimson.
Chrysolora—yellow.
Cottage Maid — pink and white.
Fabiola—rose, purple, and white.
Globe de Rigaut—lilac and white.
Joost Van Vondel—crimson and white.
Keizer's Kroon — crimson, flaked yellow.
Le Matelas — white and rose.
Pottebaakkers — scarlet, white, and yellow.
Rose Luisante — deep rose-pink.
T. Moore—orange-yellow.
Van der Neer — purple-violet.
Vermilion Brilliant — vermilion.
Wouverman—deep purple.

The best dozen early single Tulips for open-air beds are :—

Bacchus—dark crimson.
Comte de Mirabeau—white.
Couronne Pourpre—purple.
Duchesse de Parma — orange, red, and yellow.
Paul de Totter—violet.
Paul Moreelze — cherry-crimson.
Proserpine — pink and white.
Rosa Mundi — rose and white.
Royal Standard—white and rose.
T. Moore—yellow.
Yellow Prince—rose.

The double sorts mostly grown in pots are :—

Duc Van Thol—red and yellow.
Gloria Solis — crimson and yellow.
La Blason—rose and white.
La Candeur—white.
Purple Crown—deep crimson
Rex Rubrorum—scarlet.
Tournesol—scarlet and yellow.

Late-flowering Varieties.

These have chiefly sprung from *T. Gesneriana*, which naturally flowers about the month of May. They are known under the collective term of Florists' Tulips, as they have been the special object of improvement among florists for generations past; but their popularity has diminished greatly of late years. At one time the special varieties were often sold for enormous prices, and we all know the strange story of the Tulipomania.

The Florists' Tulips are classified according to their colours, and the arrangement of the colours is: *Bizarres*, feathered and flamed; *Byblœmens*, feathered and flamed; *Roses*, feathered and flamed; and *Breeders*. When a seedling Tulip flowers for the first time it is usually what is called a "self," that is, the colour is uniform; but in course of time it "breaks" into a flamed or feathered state. Sometimes years elapse before a seedling breaks. A feathered variety has the colour finely pencilled round the edge of the petals, the base of the flower being pure. In the Bizarres the ground is clear yellow; while the Roses and Byblœmens are white. In flamed flowers the stripes of colour run from the top of the petals to the base. The colours of Bizarres are various shades of red; those of Byblœmens, shades of purple and black; of Roses, pinks, roses, and scarlets. The form of the flower is important; it should be symmetrical and cup-like, with smooth petals of firm texture.

Culture.—The early garden Tulips may be grown in pots or in open beds, and their treatment is simple in both cases. The bulbs are obtainable in September and October along with other Dutch bulbs. The treatment recommended for pot Hyacinths and other bulbs suits the Tulip, about four bulbs being placed in a 4½-inch pot. Tulips for open borders should be planted not later than November; the soil should be deeply dug, and moderately enriched with manure. The bulbs should be planted from four to six inches deep, and other plants, such as Forget-me-nots, double Daisies, Pansies, or Aubrietias, may be planted after the bulbs are in.

Late Florists' Tulips require careful culture. The soil must be deep, rich, and well prepared. The bulbs should be planted in November, and will need a mulching so as to protect the young growth in early spring, otherwise hard frosts may injure them. The bulbs should be lifted after the growth is thoroughly ripened and decayed, and then kept out of the ground until planting-time comes round. In a system of special culture shelter is afforded to the beds by means of canvas or glass, but this protection need only be given during the time the flowers are in perfection.

Urceolina pendula (*Urn Flower*).—A beautiful South American plant resembling the *Eucharis* in growth. The flowers are urn-like in form, and of a bright canary-yellow tipped with green, and droop gracefully from the top of the stem. It requires to be treated the same as a *Eucharis*.

Vallota purpurea (*Scarborough Lily*).—An indispensable plant in any garden, large or small, as it produces its splendid flowers during autumn. The secret of good Vallota culture is not to disturb the bulbs often, as it dislikes re-potting. In fact, it delights in being pot-bound with roots; at the same time, when in that condition, it likes to have frequent potations of some kind of liquid manure. During its active growth too, in summer, it requires abundance of water, and cottagers act wisely in

placing their Vallota-pots in saucers of rain-water, and exposing them to the full sunshine. Unlike most other bulbs, Vallotas do not require to be dried off during winter, and so doing is often the cause of failure. The soil for Vallotas is turfy loam, a little peat, sand, and cow-manure. If large specimens are required, place a dozen bulbs in a 12-inch pot. Re-potting is best done in autumn; at the same time the small bulbs should be separated from the large for increasing the stock. In subsequent pottings, however, the bulbs must not be separated, but the whole mass placed intact in a larger pot if need be. It blooms about August, but flowering bulbs may be had in March by forcing them in gentle heat. There are four so-called varieties of *V. purpurea*, named *major*, *minor*, *magnifica*, and *eximia*. The two first-named vary in size of the flower; the others have the colour brighter than that of the type. A native of the Cape.

Veltheimia.—The two species, *V. glauca* and *V. viridifolia*, are both old-fashioned green-house evergreen bulbs from the Cape, and are related to the *Lachenalia*, and much resemble each other. As they generally flower in September and October, when there is a comparative dearth of flowers, they are valuable for the conservatory. They are easily-managed plants if grown in pots of sandy loam.

Vieusseuxia Pavonia (*Peacock Iris*). — A beautiful Iris-like plant from the Cape of Good Hope, producing blossoms about two inches across, pure white, with a large blotch of brilliant blue on each petal. It requires the same treatment as other Cape bulbs. Known also as *Vieusseuxia glaucopis*, *Iris Pavonia*, *I. tricuspis*, *I. tricuspidata*, and as a *Morœa*.

Wachendorfia.—A small genus of Cape bulbs requiring the treatment of Ixias. The species are *vaniculata*, *thyrsiflora*, and *hirsuta*. These produce tall spikes of small yellow flowers in early summer.

Watsonia.—This beautiful genus of Irids are *Gladiolus*-like in growth, but their flowers are long and tubular. The spikes are tall, and the blossoms are arranged on the upper parts in a graceful way. There are only about a dozen species in the genus, but a good number of varieties have been raised by intercrossing the showiest species. The names are in a confused state in bulb lists, and no attempt is made, as a rule, to give the names of the species correctly. The varieties are generally sold in "mixtures," and these are stated to represent "all colours," so that often in a "mixture" one may select several of the original species. The most attractive species are: *W. aletroides*, bright red; *W. angusta*, also called *fulgens* and *atrosanguinea*, deep scarlet; *W. Meriana*, bright rose-purple; *coccinea* is bright scarlet, and the finest of all; *rosea alba* is rose-pink and white; *iridifolia* is red; and *alba*, pure white, is one of the loveliest of all bulbous plants. The sorts mentioned in bulb catalogues under the names of *Louis XIV.*, *speciosa*, *marginata*, &c., may be identified with the above varieties. There is another group of *Watsonia* species of different growth and with smaller flowers. These are less important, but *W. rosea* is a pretty plant, but scarce in cultivation. They require the same treatment as early-flowering *Gladioli*.

Xiphion (*Bulbous Iris*).—Unlike ordinary Irises, these have bulbs, not creeping root-stocks; and instead of the foliage being flat, it is usually narrow and rounded. The flowers of true Irises and those of the bulbous species are similar. In trade catalogues, the name *Xiphion* is seldom used, because the kinds of Bulbous Irises consist mainly of what are popularly called English and Spanish Irises, although English is a misnomer, as both it and the Spanish race are natives of Spain and Portugal.

The *Xiphions* possess a wealth of tints in their flowers, combined in all manner of subtle hues. There are fifteen distinct species of *Xiphion* known. They are natives chiefly of the warm parts of South Europe, North Africa, and Asia Minor. Among them the following most merit the attention of cultivators:—

X. alatum, also called planifolium—a dwarf plant, with broad leaves, and large purple flowers, produced in early spring; hardy, but best when protected by a frame or hand-light. Sometimes flowers in autumn, then again in early spring.

X. Caucasicum—dwarf species; flowers rather small, pale yellow; not so desirable as others, and difficult to manage.

X. Histrio—a lovely plant from Palestine; flowers large, lilac-blue, blotched with purple; blooms in early spring; requires protection of a frame or hand-light when in bloom.

X. junceum—flowers bright canary-yellow, produced about midsummer; rather delicate in constitution, and requires careful culture.

X. reticulatum (Netted Iris)—one of the prettiest of the genus, and an indispensable plant. It is slender in growth, grows about a foot high, and produces in early spring, often as early as February, most beautiful, sweet-scented blossoms, of a rich violet-purple, blotched with gold. There are several varieties of it now, differing chiefly in colour. Krelagei is more violet in colour than the type, flowers a fortnight earlier, and cœrulea has flowers of a clear blue.

X. vulgare (English Iris), also called *Iris Anglica*, is the origin of the varieties that are known as English Irises. There are a few distinct wild varieties, viz., *Lusitanicum*, *sordidum*, *scrotinum*, and *spectabile*, and these may all be found in collections of varieties, such as are sold by bulb dealers. There

are upwards of fifty named sorts of English Irises now catalogued; all are beautiful, but many are too much alike. A dozen of the best would include Argus, pink; Bacchus, red purple; Dorothea, violet and deep purple; Eugenius, deep purple; Gertrude, white and rose; Gloriosa, lilac and white; Lady Anne, blue and purple; Lucretia, white and lilac; Nimrod, deep purple and violet; Oriental, pure white; Perfection, pale blue; Prince Albert, dark blue, blotched with purple; and Surprise, indigo blue, blotched with lilac.

X. xiphioides (Spanish Iris), also known as *Iris Hispanica*, differs from the English Iris in having small flowers with narrow petals, while the colours are different, for while the chief tints of the English Iris are purple, lilac, and white, the Spanish race consist mostly of yellows, bronzes, with white, lilac, and purple. The varieties of the Spanish are as numerous as the English Irises. A selection of a dozen include the following:—Aurora, Beauty, Cleon, Darius, Diomedes, Gem, General Havelock, Jupiter, La Vestale, Ne Plus Ultra, Romulus, and Thunderbolt; the last a very beautiful sort, with yellow and bronzy flowers. The others vary from white to different shades of purple, violet, yellow, and bronze.

Zephyranthes Treatiæ.

Culture.—No prettier effect can be produced with flowers than by planting masses of mixed varieties of the English or of the Spanish races, and as these two groups succeed each other in bloom, a garden may be kept gay for several weeks by these bulbs alone. The Netted Iris (*X. reticulatum*) blooms in early spring, and can be grown in pots, and forced into bloom quite early in the year. By potting the bulbs (about half a dozen in a 6-inch pot) in autumn, and treating them like pot Tulips, or *Narcissi*, they may be had in bloom soon after Christmas. The English and Spanish races may be grown under the same treatment, for their requirements are the same. They should be placed in a sandy and friable soil, well drained, which should not be too poor; on the contrary, both kinds repay for enriching the soil by decayed manure or leaf-mould. The bed must be open and sunny, but sheltered, and is better if raised. The bulbs must be planted in August or September, and rather deep in the soil, and the surface of the bed should be mulched. If well planted the bulbs will not need to be disturbed for at least three or four seasons, by which time the soil will have become somewhat impoverished. A mulching of manure each winter will tend to enrich the soil considerably. When the bulbs are lifted they should not be kept out of the ground long; as soon as they are dried and cleared, they should be re-planted in a fresh place in prepared soil. It is advisable to raise the beds above the ordinary level, in order to induce a dry state of the soil during winter. The strong-growing varieties, like

Thunderbolt among the Spanish Irises, may be planted anywhere, as they are not at all fastidious. The Netted Iris requires much the same treatment as the others, but as it begins to grow and flower earlier, it ripens its growth in early summer, when the bulbs may be lifted, if needed, and re-planted. All are propagated by bulblets separated at lifting-time, and these grow into a flowering size in about two or three years.

Zephyranthes (*Zephyr Flower*).—The Atamasco Lily (*Z. Atamasco*, or *Amaryllis Atamasco*) is the best-known plant in this genus, the species of which, about a dozen in number, are natives of Mexico, and other parts of Western North and South America. They have large and showy flowers, varying from white to pink. *Z. Atamasco* is white; *candida* also; *carinata* is a lovely plant with large, delicate, rose-pink flowers; *Treatiæ* has large, pure white flowers; and *tubispatha* is white and fragrant. Of these the best for ordinary culture are *Atamasco*, *carinata*, and *Treatiæ*. None of these are quite hardy, though *Atamasco* may be grown unprotected in the warmer parts, and, generally speaking, all require either pot-culture or lifting in autumn. The best plan is to keep them through the winter in pots in a frame or green-house, and plant them out in spring, in sandy soil, in full sun. The bulbs, being rather small, may number from four to six in a 6-inch pot. They are all water-lovers, and during growth must always be kept moist, *Atamasco* especially. They flower from May to the end of summer, and all being attractive in flower, are very desirable for the green-house.

TREES AND SHRUBS.

By George Nicholson.

Ribes.—There are about sixty species of *Ribes*, and the genus is restricted to northern temperate regions, and the Andes of South America; a large proportion of those in cultivation are not ornamental, and only the most desirable are here mentioned. Of course the garden Gooseberry, and the Black and Red Currants, are not included here, nor the curious varieties of these three species, with variously cut and coloured leaves, which are to be seen in botanical collections.

R. aureum, the Buffalo or Missouri Currant, has smooth, shining, lobed leaves, and is remarkable for the spicy fragrance of its yellow blossoms in early spring. There are several forms, varying a little in the period of flowering, some being without the red margin to the petals, which is so conspicuous a feature in the type.

R. Bridgesii, a Chilian species, has rough leaves, and dense racemes of small, flattish, yellow flowers. It is a pretty plant, widely different in aspect from the last-named species.

R. sanguineum, the ordinary "flowering Currant" of British gardens, is a North American plant, very widely cultivated for its abundance of red flowers produced in early spring. The best varieties are the following: *atrosanguineum*, flowers much deeper in colour than those of the type; *albida*, white, faintly tinged with rose; and *splendens*, a brightly-coloured form. The one with double flowers is rarely seen in perfection. A hybrid, *Gordonianum*, is intermediate in colour and other characters between *R. sanguineum* and its other parent, *R. aureum*.

R. speciosum is perhaps—except in favoured localities—best grown against a wall. It has dark green, small, Gooseberry-like leaves, spiny branches, and pendulous crimson flowers, remarkable for the length of the exserted stamens, in this respect resembling in a marked manner some of the Fuchsias. A native of North-west America.

Robinia.—Of the half-dozen species known to botanists, the following are in cultivation, and are amongst the most ornamental and useful of hardy deciduous trees and shrubs. All are natives of North America.

R. hispida, the Rose Acacia, has racemes of large, deep rose-coloured, scentless flowers. The variety *inermis*, or *macrophylla*, is without the characteristic bristles which densely clothe the young shoots, &c., of the type. This beautiful shrub is generally grafted on the common Locust-tree, *R. pseudo-acacia*.

R. viscosa is a smaller tree than the next, and differs from it in having the branchlets and leaf-stalks glutinous, and the nearly scentless rose-tinted flowers crowded into oblong racemes.

R. pseudo-acacia has naked branches, loose slender racemes of white fragrant flowers, and is largely cultivated for ornament, and for its valuable timber. A large number of distinct varieties have originated in gardens; the more striking of these are enumerated below.

In *crispa* some of the leaves are normal, whilst others are curiously curled; the variety is a vigorous one, and very distinct in appearance from the type; *Decaisneana* has bright rosy-coloured flowers, but otherwise does not differ from the wild tree; *fastigiata* has upright branches, and exactly resembles the Lombardy Poplar in habit; in *inermis* the characteristic rigid spines of the ordinary plant are quite wanting, and the habit, too, is widely different; without pruning it makes a small, compact,

dense round head; this is generally grafted as a standard on the common stock, and is best suited for localities where a small formal tree is wanted. *Monophylla* has the ordinary pinnate leaves of the type reduced to the terminal leaflet, though in vigorous specimens a couple of small lateral leaflets are frequently developed. *Pendula* only differs in its weeping habit, and *tortuosa* in the curious zigzag branches.

Rubus.—This genus, which contains about 100 species, is nearly confined to the Northern Hemisphere; many are beautiful garden plants.

R. Australis, a native of New Zealand, is perhaps more curious and interesting than pretty; it has thin, slender, dark green branches, beset with curved whitish prickles; the common leaf-stalk, as well as those of the leaflets, being difficult at first sight to distinguish from the branches on account of the almost entire suppression of the true leaves, which are represented by very small bodies at the tips of the long prickly stalks.

R. biflorus, a native of Nepaul, frequently mentioned in gardening journals under the name of *R. leucodermis*, which rightly belongs to a different plant, is no less ornamental in winter, when its tall pure white stems are so conspicuous, than in summer, when laden with its copious white flowers, and deep orange or orange-red fruits.

R. deliciosus, a spineless Rocky Mountain plant, has lobed Currant-like leaves, and large Rose-like white flowers; this beautiful deciduous shrub is quite hardy, and flowers freely enough as a bush in the shrubbery; it also makes a very charming wall plant.

R. discolor is one of the innumerable forms of *R. fruticosus* which are found within the limits of the British flora; the double-flowered form, which passes in some books as *R. bellidiflorus*, is very handsome, producing a profusion of rosy blossoms not unlike small Pompon Chrysanthemums in appearance. This, too, remains in bloom longer than the single-flowered type, or its near allies. A double white Bramble, a form of *R. tomentosus*—a species not found wild in Britain—is a fine companion plant to the double rose-coloured one. *R. laciniata*, the Parsley-leaved Bramble, is thoroughly well worth growing, if only for the sake of its beautifully-cut leaves; when well treated, however, it bears an abundance of large fruits, for which, indeed, we have seen it grown in a few fruit gardens.

R. odoratus—the Purple-flowering Raspberry—is a North-eastern American species, with showy rose-purple flowers a couple of inches in diameter. It has shrubby stems, three to five feet high, and simple three to five-lobed leaves, the stalks of which, as well as the branches, &c., are bristly with glandular hairs.

R. nutkanus, another North-eastern American species, is a near ally of the last; it has almost equally five-lobed, coarsely-toothed leaves, and white flowers.

R. spectabilis, from North-western America, grows about six feet high, and has ternate, or trilobate, leaves, with serrulated margins. The bright red solitary flowers are borne on pendulous axillary peduncles, and are followed by ornamental orange-red fruits.

Ruscus is a small genus of evergreen shrubs, with stout creeping root-stocks. The true leaves are minute scale-like bodies, bearing in their axils the large, rigid, leaf-like, flattened branches (cladodes). *R. aculeatus*, the Butcher's Broom, is an indigenous plant, well suited for growing under the shade of trees, where few shrubs will succeed. *R. hypoglossum* and *R. hypophyllum* are South European dwarf-growing species, with larger cladodes than those of *R. aculeatus*.

Salix (*Willow*).—This is a large genus of deciduous trees, or shrubs, mostly natives of Arctic and north temperate zones. There are about 160 species, some of which are very low-growing shrubs, scarcely exceeding a few inches in height, others being trees sometimes attaining a height of 100 feet. The following include the best for landscape effects in the park, and those most suitable for the shrubbery border, or gardens of limited extent.

S. alba, the White Willow, has narrowly lanceolate, long acuminate leaves, which are silky on both surfaces when young; it does best in somewhat marshy ground, the trunk now and then measuring twenty feet in girth, and the tree about eighty feet in height. *Cærulea* is a variety with the old leaves glabrous, and glaucous beneath; and *vitellina*, the Golden Willow, is another remarkable for the bright yellow, or red, of the young twigs. *S. alba* is found in the Old World throughout the Northern Hemisphere; its timber is valuable for carpentry, and the bark for tanning.

S. Babylonica is the common Weeping Willow, one of the most elegant and beautiful of all weeping trees. Its name is apt to perpetuate the old idea that it is a native of Western Asia; such, however, is not the case, as it has within comparatively recent years been ascertained to be Chinese and Japanese in origin.

S. Caprea (the Sallow, Goat Willow, or Palm), the earliest flowering of the British Willows, has reticulated, elliptic or oblong-obovate leaves, to-

mentose beneath; the catkin-bearing twigs, gathered at Easter, constitute the so-called Palm-branches. The variety *pendula*, the Kilmarnock Weeping Willow, is an ornamental variety of very formal habit. Like other Willows of similar habit, it must be grafted on tall stems of some common species.

S. fragilis, the Crack Willow or Withy, frequently exceeds the White Willow in height, and equals it in girth of stem; it has smooth, polished, easily-detached twigs, and lanceolate, long acuminate, glabrous, glandular, serrate leaves, pale or glaucous beneath.

S. purpurea, the Purple Osier, is a distinct, erect or decumbent shrub, with thin linear-lanceolate, serrulate, glabrous leaves, and tough, slender twigs, with red or purple bark. *Pendula*, the so-called American Weeping Willow, is a form, and a very ornamental one, of this species.

S. repens, a variable species, with small, silvery, silken leaves, is frequently grafted standard-high on tall clean-grown stems of some of the stronger-growing Willows, and when so treated is useful for many purposes for which its small stature on its own roots would exclude it. *S. Woolseyana* is a garden name for one of the numerous forms of this widely-distributed and variable plant.

Sambucus (*Elder*).—The following two species, and their varieties, are the most ornamental of the Elders in cultivation:—*S. nigra*, our native Elder, is too well known to need description; there are, however, a considerable number of garden forms, some of which are amongst the most desirable of deciduous foliage shrubs. Foremost among these is *aurea*, one of the best and brightest, as well as one of the most easily-grown shrubs with golden leaves. *Laciniata* has the leaves finely cut. In addition to these there are varieties with variegated leaves, and others in which the leaflets differ from those of the type in outline. The colour of the fruit varies too; there are forms in which these are whitish or greenish. *S. racemosa*, a European species, is remarkable for its large clusters of coral-red fruits, and two or three forms, with variously-cut leaves, are well worth growing for the foliage alone. Unlike *S. nigra*, which thrives under almost any conditions, *S. racemosa* requires a cool spot; if planted in an open dry place it is more than probable that the plant does not succeed, and the beautiful brightly-coloured fruits are not produced.

Sassafras officinale is a small tree, ranging from fifteen to fifty feet in height, nearly allied to the Sweet Bay, &c., from which, however, it differs markedly in its four-valved anthers. It has rough, spicy-aromatic bark, yellowish-green twigs, and greenish-yellow flowers in clusters, appearing with the ovate entire or three-lobed leaves. A native of the Eastern United States. This was formerly, and in some works is still, known under the name of *Laurus sassafras*.

Shepherdia contains but three species, all natives of North America. Decidedly the most ornamental one is *S. argentea*, the Buffalo-berry of Upper Missouri; this has narrow leaves, silvery on both surfaces, and edible, acid, scarlet fruits. It is quite hardy in this country, and perhaps thrives best in a strong damp soil; the plant most frequently met with under this name in gardens is *Elæagnus argentea*, which is not unlike the real Buffalo-berry in general aspect.

Skimmia is a small genus of evergreen shrubs belonging to the Rue family. The first species introduced—viz., *S. Japonica*—is the best for general ornamental purposes; it has terminal panicles of whitish flowers, succeeded by showy scarlet berries. In its native country it is said to grow six feet high; under cultivation it is rarely seen above two feet high. *S. oblata* has larger leaves and berries, and is a more robust grower, but the flowers in this seem practically unisexual; therefore, in order to secure berries it is necessary to plant the two sexes. Both the preceding seem to like a peaty soil best, but they will grow well in spots in which peat is altogether absent; a strong clay for instance. They are readily raised from cuttings or seeds.

Sophora Japonica, a native of Japan and China, is one of the most ornamental of hardy, deciduous, leguminous trees. It retains its dark green unequally pinnate leaves until frost, and, unlike some of its allies, they are not shed and do not discolour during dry seasons in summer. The large-branched panicles of small Pea-shaped flowers develop in August and September, and give a peculiar aspect to the tree. A weeping variety of this—where it does well—is one of the prettiest of weeping trees.

Spartium junceum, the Yellow Spanish Broom, produces large, golden-yellow, fragrant flowers in terminal racemes in July and August. It is a rapid grower, is readily raised from seed, and is one of the best of flowering shrubs for planting on poor, dry, gravelly banks. A double-flowered form is interesting, but hardly so desirable as the type.

Spiræa.—This genus contributes rather largely to the out-door decoration of British gardens. A large number of shrubby species have been intro-

duced to cultivation, and from these a host of hybrids and garden forms have originated. The more remarkable of the species are mentioned below. They are of the easiest cultivation, succeeding in almost any soil or situation. Most produce suckers from the roots, and these furnish the most rapid means of increasing the stock of any particular bush; cuttings of the half-ripened or young wood strike readily under glass, and seeds ripened in this country germinate freely.

S. ariæfolia, a native of North-western America, makes a beautiful specimen plant if placed under conditions where it can be allowed to develop fully and produce its profusion of small whitish flowers; these are borne in large, terminal, feathery panicles in June and July. The leaves are somewhat like those of the White Beam-tree (*Pyrus aria*) in outline, hence the specific name.

S. bella, from Nepaul, has ovate-acute, serrate, glabrous leaves, and terminal spreading cymes of rosy-red flowers; it grows about three feet high, less than half the height of *S. ariæfolia*.

S. chamædrifolia and *S. confusa* are two nearly-allied Asiatic species, with crenately-lobed leaves and corymbs of pure white flowers. Both are very floriferous species, and are well adapted for forcing.

S. Douglasii, a North-west American plant, has simple oblong-lanceolate obtuse leaves, the under surfaces of which are clothed with a white tomentum. The red flowers are borne in a large, dense, terminal thyrsoid panicle.

S. Lindleyana, a Himalayan species, has large unequally pinnate leaves, and large much-branched terminal panicles of white flowers, which open in September.

S. Nobleana is a near ally of *S. Douglasii*, but differs from it in its later inflorescence and purplish-red flowers; it is also a native of North-western America.

S. prunifolia is a Japanese species, with small glabrous lanceolate leaves, and clusters of pure white double flowers, produced in spring, the whole length of the slender branches; the form generally met with has double flowers, the single-flowered one being as yet very rare.

S. sorbifolia somewhat resembles *S. Lindleyana;* it however rarely exceeds three or four feet in height, whilst its ally grows double that size; the smaller terminal panicles of white flowers, too, are erect, and not arching as in that species.

S. Thunbergii is a very beautiful dwarf-growing Japanese species, with narrow linear, light green, glabrous leaves, and starry pure white flowers, produced from the axils of the leaves the whole length of the branches; it is a charming plant for pot culture and forces freely.

Staphylæa.—In this genus there are only four or five species, and all of them are pretty deciduous shrubs. *S. Colchica*, from Western Asia, is a compact grower, and produces panicles or racemes of white flowers in spring; it is an excellent plant for the shrubbery or for growing in pots for forcing purposes. *S. pinnata*, the common Bladder-nut, is here and there naturalised in Britain; it has unequally pinnate leaves and grows about six or eight feet high —a native of Central Europe. *S. trifoliata*, a native of the Eastern United States, differs from its European ally in having trifoliolate leaves and larger white flowers.

Styrax.—A small genus of deciduous shrubs represented in the European flora by *S. officinale*, which furnishes the storax of the shops, and by three American and two or three Japanese species. One of the latter, *Styrax Japonica*, is a handsome plant with long-stalked, pendulous, snow-white flowers, and thin, oval, shortly-stalked, glabrous leaves. It flowers in June, and the pure white corollas and golden anthers form a pleasing contrast to the bright green leaves. *S. Americana* has axillary three or four-flowered racemes, and oblong leaves tapering to both ends; it is not, however, so handsome as the species just mentioned. Both like peaty soil, but do well in ordinary loam. Propagated by cuttings inserted in sandy peat under a hand-glass in June or July.

Symphoricarpus.—All the members of this genus are natives of North America, and are easily-grown deciduous shrubs. The best known is *S. racemosus*, the Snow-berry, with its loose, somewhat leafy, interrupted spike of small white flowers, followed by large bright white berries. This is an excellent plant for naturalising in the wild garden. *S. occidentalis*, the Wolf-berry, has larger flowers and smaller white berries. *S. vulgaris*, the Indian Currant or Coral-berry, has small dark red berries; there is a form of this, too, with golden-variegated leaves, but in most places it shows a decided disposition to revert to the type.

Syringa (*Lilac*).—Probably all the true species of Lilac in cultivation are mentioned in these notes, and the wild types—although some of them for general decorative purposes are far surpassed by hybrids and forms of garden origin—are thoroughly well worth a place in any garden. *S. Amurensis*, a native of Amurland, is the most recent introduction; it is a dwarf-growing bush with ovate or roundish leaves, and panicles of creamy-white flowers. *S. dubia*, the Siberian Lilac, passes muster in most gardens as *S. Persica*, from which, however, it widely differs; it

is, too, readily distinguished from the common Lilac, *S. vulgaris*, by its more graceful habit, smaller stature, narrow leaves, and more profuse inflorescence of reddish - violet hue—there are several forms, varying principally in the colour of the flowers. *S. Emodii*, a Himalayan species, has large oblong net-veined leaves, warted branches, and dense erect panicles of lilac or white flowers. *S. Josikæa*, a native of Eastern Europe, has ovate-lanceolate, wrinkled, dark green leaves, and bluish-purple scentless flowers. The true *S. Persica* is the smallest of the group, it has slender branches, narrow ovate-lanceolate leaves, and flowers varying in colour from rosy-carmine to white. A form with laciniated leaves is in cultivation, and this seems to be not uncommon in a wild state. *S. vulgaris*, the common Lilac, is perhaps, with the single exception of the Laburnum, the most popular of all spring-flowering shrubs. It has been in cultivation in this country for about three centuries, and although its origin is somewhat uncertain, it is believed to have been brought from Persia. It would occupy too much space to give a description of the numerous garden varieties, the names of which may be found in nursery catalogues; of recent years a series of remarkable double forms have originated in Continental gardens.

Tamarix.—Comparatively few of the score or so species of this genus are in cultivation, and for practical purposes *T. Gallica* is the only one worth notice here. Its minute Heath-like leaves and dense spikes of small reddish flowers render it very conspicuous, and totally unlike any hardy shrub belonging to any other family. It is invaluable for planting near the sea, when it thrives in spots where scarcely any other shrub can be induced to grow. Inland, however, it attains a considerable size—we have seen specimens about twenty feet high—and its feathery branches when laden with blossoms attract the attention of even the least observant. The Tamarixes are generally found wild in dry sandy spots, so they should not be planted where there is any stagnant moisture.

Tilia (*Linden*).—There are hardly more than half a score species of Lindens, and all—with the exception of *T. Mandschurica*, which begins to grow too early and often gets injured by the late spring frosts—are hardy ornamental deciduous trees of great value. The genus is confined to Europe, North Asia, and North America. The timber is said to be superior to that of nearly every other tree for ornamental carving, and from the inner bark of some of the species are made the bass mats so largely used in gardens for shelter, shading, &c.

T. Americana, the Basswood of the Eastern United States, has thickish green leaves, which are nearly or quite glabrous. It grows sixty or eighty feet high, with a trunk three to four feet in diameter.

T. argentea, the White or Silver Lime, is one of the handsomest species, and attains a considerable size. The greyish-white bark, the dark green leaves, clothed with a silvery pubescence beneath, and the erect habit furnish characters sufficient to distinguish this from any other. It is a native of Eastern Europe, &c.

T. cordata is perhaps better known under one or other of the following names—*T. parvifolia*, *T. ulmifolia*, or *T. microphylla*. It is a small-leaved species, the latest to flower of the three Limes most commonly cultivated, the two others being *T. platyphyllos* and *T. vulgaris*. It suffers, too, in dry seasons much less than either; in some of the Continental cities, &c., where the three were growing in company, *T. cordata* looked fresh and green in the August of 1885, whilst the foliage of its allies was burnt and discoloured, or had to a great extent fallen, on account of the phenomenally hot and dry summer. A native of Britain, and widely distributed throughout Europe and Asia.

T. euchlora is a distinct and handsome species with dark green, glossy leaves, glabrous except in the axils of the principal veins on the under surface. A native of the Caucasus, &c.

T. Europæa really includes two distinct species—*T. platyphyllos* and *T. vulgaris*. The first has rough hairy leaves, and is the first to flower; the latter has smooth leaves, more or less with a glaucous tinge beneath, and glabrous, except in the axils of the principal veins. Of these two a large number of slightly varying forms are cultivated in nurseries, &c.

T. petiolaris is the correct name of the Lime generally grown under the name of *T. Americana pendula*. In general aspect of foliage, &c., it resembles *T. argentea*, but differs in its long-stalked leaves and pendulous branches. Native of Eastern Europe.

The numerous garden varieties of the species above-mentioned are propagated by grafting on clean-grown seedling stocks of the common wild types.

Ulex (*Gorse*).—There are about a dozen species of Gorse, all natives of Western Europe and North-western Africa. Two of the British ones are as desirable and distinct as any of the others. *U. Europæus* begins to open its golden-yellow flowers in February and March, whilst the dwarf, compact-growing *U. nanus* does not commence flowering until July, and continues until November; the double form of the first-named is a valuable bush for dry banks, and it remains in flower much longer than the

single-flowered type; as it does not produce seeds, this must be raised from cuttings.

Ulmus (*Elm*).—All the Elms—there are about sixteen species—are natives of the north temperate zone. All are hardy in this country, and the following is a list of the more remarkable and valuable species and varieties.

U. alata, from the United States, is conspicuous on account of the corky winged branches; the ovate-oblong, or oblong-lanceolate, acute, thickish leaves are downy beneath. The hard, compact, unwedgeable wood is employed for hubs of wheels, &c. As a rule the tree does not exceed thirty or forty feet in height.

U. Americana, the White Elm, is a large and well-known ornamental tree, usually with spreading branches and drooping branchlets; the branches are not corky, and the obovate-oblong, or ovate, abruptly-pointed leaves have sharply—often doubly—serrated margins.

U. campestris is the common Elm of Britain; as, however, it never seeds with us, it is fair to assume that it is not a true native, but an introduction from Central or Southern Europe, &c. It is a very large tree, sometimes 125 feet high, with a trunk twenty feet in girth. A very large number of garden forms have originated from this species, some with yellowish, purplish, or variegated leaves, others with variously curled, or crisped, foliage. Some of the best are the following: *aurea*, a neat, small-growing, slender form, with golden-yellow leaves; *Berardii*, with dark green leaves about the size of those of the Myrtle; *fastigiata* differs principally from the type in its erect habit: *microphylla* is a small-leaved distinct form; and *pendula* has weeping branches.

U. montana, the Scotch Mountain or Wych Elm, has much larger leaves than *U. campestris*. Like that species, too, it possesses a host of garden forms, amongst the most noteworthy being *nana*, a compact dwarf-growing bush, not exceeding four or six feet in height by as much through in a quarter of a century; *pendula* is one of the most decided and desirable of all weeping deciduous trees; *filicifolia* has deeply-cut, thick, rigid leaves.

Vaccinium.—This genus contains about a hundred species of evergreen or deciduous shrubs, natives of Europe, and temperate and sub-tropical Asia and America. All do best in a peaty soil, and those here described are hardy as well as very ornamental. In the limits of the British flora the genus is represented by the Whortle-berry, *V. Myrtillus*; the Cowberry, *V. Vitis-Idæa*; and *V. uliginosum*; the second-named being a pretty little procumbent shrub, with glossy evergreen Box-like leaves, pink-tinted flowers, and globose, red, acid fruits; *V. uliginosum* has bluish-black berries.

V. corymbosum is the common or Swamp Blueberry of the North-eastern United States; it has ovate or oblong leaves, and large dense clusters of pink-tinted flowers, the corollas varying considerably in size and shape; the leaves are deciduous, and the sweet blue or black berries are covered with a fine bloom. This species grows from five to ten feet in height.

V. Pennsylvanicum, the Dwarf Blue-berry, grows little more than a foot in height, and has large sweet berries, ripening in July; the leaves are lanceolate or oblong, distinctly serrulate, with bristle-pointed teeth.

Viburnum.—This genus contains about eighty species, the majority of which are found in temperate regions of the Northern Hemisphere. Some of these, notably the sterile cultivated form of the Guelder Rose, *V. opulus*, and the Chinese, *V. plicatum*, are amongst the most beautiful of hardy, deciduous, flowering shrubs.

V. Lantana, the Wayfaring Tree, is an indigenous plant, with rugose, oblong, serrulate leaves clothed—especially beneath—with a scaly tomentum. It ranges from six to twenty feet in height, and when laden with its large, flattened, sessile clusters of red or blackish-red fruits, is a very ornamental object. There is a form in cultivation with very prettily golden-variegated leaves.

V. Lentago, the Sweet Viburnum or Sheep-berry of the Eastern United States, has bright green, finely-serrate, ovate, strongly-pointed leaves, with long margined petioles; the oval, edible, black fruit, half an inch or more in length, ripens in autumn. The flowers in this species are all perfect, and the tree attains a height of from fifteen to thirty feet.

V. macrocephalum, a Chinese species, is not unlike *V. Lantana* in foliage characters. The form in cultivation is a dwarf, compact-growing bush, with enormous heads of white barren flowers.

V. nudum, the White-rod of the Eastern United States, has thickish, oval, oblong, or lanceolate, dark green leaves, the margins of which are entire, repand, or crenate; the cymes of white flowers are sessile, and the round-ovoid black fruits are about a quarter of an inch in length. This species, of which there are two or three varieties in cultivation, ranges from six to ten feet in height, and flowers in May or June.

V. opulus, the Guelder Rose, is probably, next to the Lilac and Laburnum, one of the most popular of flowering shrubs. Perhaps it would be more correct to say this of the variety *sterilis*, the Snowball-tree,

for it is this garden form, with all the flowers neuter, and not the wild plant—in which only the outer ones are barren—which is such a favourite in old-fashioned gardens throughout the country. The acid, bright red fruits serve as a substitute for Cranberries in the United States, for the Guelder Rose is distributed over most countries of the Northern Hemisphere. There is a curious, very dwarf-growing form, which never exceeds a foot or a foot and a half in height, and there is another with yellow fruits.

V. plicatum, from North China, has globular heads of snowy-white flowers, much like those of the Guelder Rose, but the plaited, oblong, serrated leaves are very different from those of that species. It is a wonderfully pretty shrub and forces fairly well.

V. prunifolium, the Black Haw of the North-eastern United States, has oval obtuse, or slightly-pointed, finely-serrated leaves, sessile cymes of small flowers, and fruit similar to that of *V. Lentago*, but rather smaller; it is a tall shrub, or small tree, and flowers in May and June.

V. Tinus, the Laurustinus, is the only evergreen species mentioned in these notes. Some of the varieties—for the type is so generally grown, and so well known, that it is useless describing it here—are very desirable plants. *Lucida* has glossy dark green leaves, and is a compact-growing floriferous form, better adapted for forcing than the common Laurustinus. *Frœbelii* has light green leaves and white flowers, without any tinge of red; this, too, forces better than the type. The species which fruit freely are easily increased from seed; the Laurustinus is readily raised from cuttings. The set with barren flowers, such as *V. plicatum*, &c., may be propagated by grafting on seedling stocks of the Guelder Rose.

Vitis (*Vine*).—There are upwards of a couple of hundred species of *Vitis*, but comparatively few of these are in cultivation for decorative purposes. The following are amongst the best.

V. arborea, or *V. bipinnata*, from the Eastern United States, is quite unlike any of the other species mentioned in these notes; it is nearly glabrous, and has large, twice-pinnate, or ternate, leaves, with cut-toothed leaflets. The inflorescence is cymose, and the black berries are obovate in form.

V. cordifolia, the Winter or Frost Grape, also from the United States, is remarkable for its deliciously sweet-scented flowers; the leaves are thin, not glossy, heart-shaped, acuminate, sharply and coarsely toothed, and the large loose compound panicles are followed by small blue or black acid berries, which ripen after frosts.

V. heterophylla is a Japanese species, of which the most desirable variety is *humulifolia;* this has cymose clusters of finely-coloured blue berries, which when perfectly ripe assume a turquoise tint. For mixing with autumn flowers in vases, &c., the fruiting sprays of this small-leaved, slender-growing plant are very effective.

V. Labrusca, the Northern Fox-grape of North America, has dark purple, or amber-coloured berries, with a tough muscy pulp; in some of the Continental Vine-growing countries this species has been largely used as a stock on which to graft the more tender varieties, since the Phylloxera has created such havoc in the vineyards where the Vines were grown on their own roots; *V. Labrusca*, and some other of the North American Vines, being apparently better fitted to withstand the attacks of that insect than the varieties of *V. vinifera*. Some of the Vines largely cultivated in the New World for their fruits have originated from the species now under notice. The branchlets and young leaves are very woolly, the leaves continuing rusty-woolly throughout.

V. lanata, a Himalayan Vine, has more or less woolly leaves of large size; before falling these assume a bright scarlet colour. Planted so as to climb amongst the branches of not too dense-growing evergreens, this species produces splendid foliage effects in autumn.

V. tricuspidata, perhaps better known as *Ampelopsis Veitchii*, is a Japanese climber, with trifoliolate, or three-lobed or five-lobed leaves, which assume in sunny spots the same beautiful autumnal tints which characterise the Virginian Creeper in autumn; the young leaves—or rather the leaves produced by young plants—are small; when they are thoroughly established and come to the flowering stage, the foliage is much larger and coarser in character. *V. tricuspidata* attaches itself firmly to walls, &c., against which it is planted, and is one of the best of rapid-growing climbers.

V. vinifera is too well known to need description, but the two following varieties are much less widely known than they deserve to be. *Laciniosa*, or the Parsley-leaved Vine, has elegantly-cut leaves; it fruits freely, too, and is well worth a place on a warm sunny wall. The foliage of *erubescens* is like that of the common Vine in outline, but in autumn it assumes a rich claret-red colour.

Wistaria.—Only about four or five species are known, one of which is North American, and the rest from China and Japan. *W. Sinensis* is deservedly one of the most popular of early spring-flowering climbers; there are a white-flowered and a double variety, but in the opinion of most people these do not equal the ordinary purplish-lilac one in beauty.

W. frustescens, the North American species, has darker violet-tinted flowers in shorter racemes than the common Wistaria; it flowers, too, in autumn, and is well worth a place on a wall or trellis.

W. Japonica is a pretty plant, with slender racemes of smaller white flowers; it is not so vigorous a grower, and, therefore, should be planted where its allies would prove too large.

Xanthoceras sorbifolia, the only species of the genus, is a native of North China, and is nearly allied to *Kœlreuteria*, upon which it may be grafted. A good way of increasing the stock of this beautiful little tree is by means of root-cuttings, should seeds not be available. The foliage is somewhat like that of the Mountain Ash, and the rather large flowers, white with a purplish eye, are produced in terminal simple racemes in May and June.

Zelkowa.—This genus comprises but a few species, those here mentioned being ornamental deciduous trees with valuable timber. *Z. crenata* is a quick-growing, handsome tree, with rigid dark green crenated leaves, and a rather upright—not spreading—habit. There is a weeping variety in cultivation, and also one with variegated foliage. A native of the Caucasus. The Japanese *Z. acuminata* has larger, more papery leaves, with long acuminate points, sharper serratures, and more numerous nerves. Both species grow well in moist soils.

Zenobia.—The plant now forming this genus was formerly placed under *Andromeda*, similar treatment to which it requires. There are few more beautiful objects than a well-flowered bush of this handsome Heathwort. Two or three varieties are in cultivation, differing principally in the colour and form of the leaves; the type, *Z. pulverulenta*, has foliage covered with a whitish bloom, whilst *nitida* has light green leaves without any of the powdery covering which is so conspicuous in *pulverulenta*. Both have large, pendulous, Lily-of-the-Valley-like, white flowers.

CONIFERS.

By George Nicholson.

THE natural order *Coniferæ* comprises, according to the "Genera Plantarum," 32 genera and about 300 species. They are found in almost all parts of the world, but principally affect temperate and mountainous regions, and in the Northern Hemisphere form vast forests in some countries. Whether regarded from a purely economic or landscape-gardener standpoint, they are undoubtedly of the highest importance. Within the last generation too many Conifers have been planted in proportion to deciduous trees, for purposes of ornament, and to this are due the somewhat monotonous and sombre effects which obtain in too many parks and gardens. In the following notes a few of the more remarkable species of each section or genus, and some of the most ornamental or striking varieties, are mentioned; those of purely botanical interest being omitted.

Abies (*Fir*).—A good deal of confusion unfortunately exists between this genus and *Picea*; in most books the names of the two genera are transposed. The true species of *Abies*, of which the common Silver Fir, *A. pectinata*, may be taken as the type, have flattened leaves, generally more or less definitely arranged in rows, on each side of the branch, and cones with scales which are deciduous and fall off when the seed is ripe, leaving the axis on the tree. All the species, about a score in number, are natives of the temperate regions of the Northern Hemisphere.

A. amabilis, a native of British Columbia, is closely allied to *A. grandis*, from which it is readily distinguished by its very crowded and darker green foliage, and its large dark purple cones; excellent figures of this rare and handsome Fir are given in the *Gardener's Chronicle* for December 4th, 1880. The late Dr. Engelmann, one of the greatest authorities on North American Conifers, thus describes the species in the very locality where it was first discovered by Douglas sixty years ago: "It is a magnificent tree at about 4,000 feet altitude; the largest specimen, growing on the banks of a mountain torrent, was probably 150 to 200 feet high, with a trunk about four feet in diameter, branching to the ground and forming a perfect cone of dark green foliage. The bark of the old tree is one inch and a half to two inches thick, furrowed and reddish-grey; that of younger trees, less than 100 years old, is quite thin and smooth, light grey or almost white."

A. balsamea, the Balsam or Balm of Gilead Fir, is a native of Eastern North America from Canada and Nova Scotia to Virginia, Wisconsin, and Minnesota. It is principally valuable as the source of the Canada balsam of commerce. Now and then, in the cold damp woods and mountain swamps of its native habitats, it attains a height of seventy feet with a trunk upwards of eighteen inches in diameter. It has smaller, thinner leaves than the European *A. pectinata*, which it resembles in general aspect.

A. brachyphylla, a native of Saghalien and Japan, is a handsome species, one of the hardiest of the Fir tribe. It has only been introduced into this country about fifteen years, consequently no large specimens as yet exist, but in Japan it is said to make a mag-

nificent tree 120 feet in height. The cones are three or four inches long and purple when fully matured; the leaves, from three-quarters to one and a half inch in length, are bright green above and marked with two silvery lines beneath.

A. bracteata, from Southern California, should be planted in high exposed situations, otherwise it is apt to start too early into growth in spring, and get injured by late frosts. The specific name was given on account of the bracts of the cone, which are developed into long rigid leaf-like processes a couple of inches in length. A beautiful but slow-growing tree, with long dark green leaves, quite dissimilar in appearance from those of any other Fir.

A. Cephalonica has rigid leaves terminating in a sharp point; the species flourishes in a variety of soils, and thrives wonderfully well in the peaty woods in the South of England. It is best to plant it in high or somewhat exposed situations, to guard against the young tender growths being damaged by late frosts. A native of Greece, &c., where it attains a height of about sixty feet.

A. concolor—the White Fir, so called by reason of the grey bark of the trunk—is common in a wild state throughout the Californian sierras from 3,000 or 4,000 to 8,000 feet elevation; it extends also into Southern Oregon and through the mountains of Arizona to Utah and South Colorado. It makes a large tree, from to 80 150 feet in height, with a trunk two to four feet in diameter. *A. Parsonsiana*, also known in gardens as *A. lasiocarpa*, and *A. Lowiana*, is a long-leaved form of this species.

A. firma is the common Silver Fir of Japan, whence it was sent to England in 1861 by Mr. J. G. Veitch. It has rigid leathery leaves, dark glossy green above and paler beneath; it is quite hardy and forms a handsome tree; in Japan it is said to attain a height of 150 feet.

A. grandis is the largest species in the genus; in British Columbia and California it reaches 200 or 300 feet in height, with a trunk three to four feet in diameter. It is a perfectly hardy tree of symmetrical habit, with leaves one inch to one and a quarter long, apple-green above and silvery beneath.

A. magnifica, a native of the Californian sierras, is, in its native habitats, a stately tree 200 feet or more in height, with a trunk eight to ten feet in diameter; it has densely-crowded leaves—the longest being an inch and three-quarters in length—olive-green, very glaucous on the upper surface when young, the colour becoming deeper and duller by age, and marked by two silvery lines beneath. Good figures of this plant—which in cultivation is confused with other species—are given in the *Gardener's Chronicle* for November 21st, 1885.

A. nobilis, from Northern California, &c., is one of the finest of all Firs. Its regular, symmetrical habit, the deep glaucous green of the dense curved leaves, and the handsome cones, which are freely produced in cultivation, combine to render this one of the most popular of Californian Conifers. It thrives in a variety of soils, but is more apt than most of its congeners to be attacked by an aphis which causes the tips of the twigs to become clubbed and unsightly. The pest which does so much injury to this species can, however, be destroyed by a careful employment of an emulsion of paraffin. A very fine variety of *A. nobilis* called *robusta* is figured in the *Gardener's Chronicle* for November 21st, 1885; it differs markedly from the type in the horizontally spreading bracts. In gardens, this form is grown under the name of *A. magnifica*, a name which rightly belongs to a totally different plant.

A. Nordmanniana, a native of the Crimea and the Caucasus, is one of the least exacting of all the Firs; it thrives well in almost any soil, grows rapidly, and is rarely injured by frosts, as it does not begin to grow until summer has fairly set in. It is a beautiful-habited plant, with deep glossy green leaves.

A. pectinata, the Silver Fir, "forms an important element of the great forests that cover the mountain-sides of Central and Southern Europe, whence it has spread under cultivation into all the neighbouring countries." In England it is often planted for profit, but in many places the leader is frequently injured by spring frosts; it should therefore have a somewhat sheltered situation. Full-grown trees in alluvial valleys attain a height of 100 or 150 feet; near La Petite Vache, in Dauphiné, are two specimens, which measure respectively, at four feet from the ground, 7·40 and 6·50 mètres in circumference.

A. Pinsapo is remarkable on account of its restricted geographical distribution; in a wild state it only occurs on the mountains of Central and Southern Spain. Its erect, rigid, sharply-pointed, bright green leaves are close-set all round the branches. In its native habitats it forms a tree 60 to 80 feet high, of pyramidal habit, with branches right down to the ground. It is quite hardy, and forms a very ornamental tree for the park or pleasure-ground.

Araucaria.—This genus contains about ten species, natives of South America, Australia, New Caledonia, and the islands of the South Pacific. The only species, however, which can lay claim to be hardy is the Chili Pine, *A. imbricata*, introduced in 1722. The harsh, rigid, scale-like, and persistent foliage of dark green, and the singular mode of branching, render this tree very conspicuous. The seeds, borne in large round cones, are eaten in Chili, where it forms wide-spread forests, between the parallels 37° and 48° south

latitude. The cones are about the size of a child's head, each enclosing between 200 and 300 nuts, and not unfrequently twenty or thirty cones are borne on a single tree, so that eighteen Araucarias are reckoned to maintain a single person a whole year. The nuts, in form like an Almond, but twice the size, are eaten by the Indians, either fresh, boiled, or roasted, the latter mode of cooking giving them a flavour something like a Chestnut. On one of the lawns at Kew (near the Succulent House) one of the few original plants still remains, and the following interesting extract concerning it is contained in the "Official Guide to the Royal Botanic Gardens and Arboretum":—"This specimen, one of the first introduced, was brought to England by the late Archibald Menzies, Esq., surgeon and naturalist to Vancouver's Voyage to North-west America in 1798. . . . Mr. Menzies, when dining at the table of the Governor of Valdivia, had the seeds offered him at dessert. On being told that they were the seeds of a great Pine of the Andes, he took some away in his pocket and sowed them in a pot on board ship. He tended the young plants carefully during the remainder of the voyage, giving them a share of his allowance of water when that was reduced to little more than a pint a day. On arriving in England, Mr. Menzies presented the young plants to Kew, whence four were distributed and one remains." For a long time the Araucarias were supposed to be dicœcious, but trees in various parts of the country have produced both male and female catkins; an illustration of a branch (showing this monœcious character) taken from a tree in the famous Bicton Arboretum, is given in Messrs. Veitch's "Manual of the Coniferæ." Araucarias thrive best in a moist, but thoroughly drained soil, free from stagnant moisture. In the peaty woods in the South of England they grow rapidly, but fine specimens exist in many parts of the country on soils which contain no peat.

Biota.—This genus contains but a single species, which, however, is a very variable one. A host of forms have originated in this country, and a number which have been found in a wild state, or have developed under cultivation in Japan and China—the home of the species—have been imported into Britain. *B. orientalis*, the common Chinese Arborvitæ, is perfectly hardy, and is one of the most useful of garden evergreens. The following are among the most remarkable of the varieties: *aurea*, or as it is sometimes called, *compacta aurea*, is the Golden Chinese Arborvitæ; it forms a round-headed bush five or six feet high, whilst the ordinary green-leaved type attains a height of from eighteen to twenty-five feet; in early spring the young growths are a rich golden-yellow, but as the season advances the colour gradually changes to the bright green characteristic of the typical species. *Elegantissima* is a dwarf-growing form of fastigiate habit, the somewhat rigid branchlets retaining their fine golden-yellow tints throughout the summer. *Meldensis* originated in France about 1853, and at one time was supposed —so different is it in general aspect from the common Chinese Aborvitæ—to be a hybrid between that and the Virginian Red Cedar. As, however, similar forms have been raised from seed, both in this and in allied genera, it is now regarded as nothing more than a seminal sport; the principal characteristics of this strange plant are the light bluish glaucous green of the branchlets during summer, and their reddish-brown tint in winter. *Pendula* has curious elongated, pendulous, cord-like branches with few ramifications, and for a long time was believed to be a distinct species: seedlings, however, raised from it have reverted to the type.

Semperaurescens is somewhat like *aurea* in habit, but differs from that in retaining the golden hue of the foliage throughout the season.

Cultivation.—The Chinese Arborvitæ is most readily raised from seeds, which are freely enough produced in Britain, and the varieties may be propagated from cuttings inserted in sandy soil in a cold frame in August or September, and carefully shaded from bright sunshine, or they may be grafted on the common type. All are nearly indifferent as to soil, and thrive well under very varied conditions.

Cedrus.—There are three species of Cedar—unless it be held, with some authorities, that these are but geographical forms of one. The distribution of the genus is somewhat peculiar.

One, *C. Libani*, the Cedar of Lebanon, occurs in Syria, with a distinct and very interesting form, on the mountains of Cyprus; the second, *C. Atlantica*, is restricted to the Atlas range in North Africa; and the third, *C. Deodara*, is confined to the Himalayan region. The first two are probably the most picturesque and magnificent of all the Conifers which are hardy in Britain. The Deodar principally differs in the drooping extremities of the branches; in some places it makes a beautiful tree, but in most it is much inferior in grandeur and beauty to its two allies. As a rule the Cedars will thrive wherever the Larch will succeed, and noble specimens exist in the neighbourhood of London in deep sandy or gravelly soil.

C. Atlantica.—A large tree of broadly pyramidal habit, scarcely distinguishable in its maturity from the Cedar of Lebanon, except that the branches are shorter and less tabuliform; the leaves also are shorter, thicker, and more prickly. A variety with

shorter, very silvery leaves, *glauca*, is grown in nurseries, and is propagated by grafting on the type.

C. Deodara—the Deodar, or Indian Cedar—was introduced from the Himalayas in 1831, and some of the finest specimens in Britain are now between sixty and seventy feet in height. There are several varieties cultivated, the following of which are the best:—*Argentea* has leaves almost silvery in colour; in *robusta* both leaves—which are but slightly glaucous—and branches are much stouter than in the type; *viridis* has foliage of a deeper green than that of the ordinary type. These varieties must be propagated by grafting on clean-grown vigorous stocks of any other Cedar.

C. Libani also presents some interesting varieties, the best of which is *argentea*, remarkable for its very glaucous foliage; *brevifolia*, recently discovered in Cyprus, differs principally in its very short leaves and smaller cones. The most recent and the most trustworthy account of the condition of the famous Cedar grove on Lebanon is that given by Sir J. D. Hooker in the *Natural History Review*, January, 1862. Abstracts from this paper are contained in Messrs. Veitch's very useful "Manual of the Coniferæ."

Chamæcyparis.—Some of the plants now referred to here were formerly considered to belong to the genus *Cupressus*, and others were believed to be sufficiently distinct to form a genus apart, viz., *Retinospora*. All are natives of North America or Japan. Several are amongst the most popular of cultivated Conifers; they thrive under a variety of conditions as regards soil and situation, but perhaps do best in a damp but well-drained peat. All are readily propagated by cuttings either struck in heat or in a cold frame, &c.

C. Lawsoniana, perhaps better known as *Cupressus Lawsoniana*, is one of the most variable of evergreen shrubs or trees; a host of forms are cultivated in nurseries. The type was introduced from Upper California in 1854; in its native habitats it attains a height of upwards of 100 feet. The pendulous Fern-like feathery branchlets, and the deep glaucous green foliage and graceful habit of this species render it one of the most useful for general decorative purposes. *Argentea* has glaucous foliage of almost silvery whiteness, and longer and more slender branches than in the type. *Erecta viridis* is a compact form with a tapering fastigiate habit, somewhat like that of an Irish Yew; it has light bright green leaves, and is a very distinct plant. In *flavescens*, or *lutea*, the whole of the young growth is a light clear yellow, which becomes much deeper in winter. *Nana* is a slow-growing, very compact bush, almost globose in outline, and deep green in colour. Besides the varieties already mentioned — which are, perhaps, the most distinct in general characters—there are many others which are almost equally desirable.

C. Nutkænsis, widely cultivated under the name of *Thujopsis borealis*, is also a native of North-west America, whence it was introduced about thirty-five years ago; it differs from the last-named species by its more robust habit, its paler green foliage, and sulphury-yellow, instead of red, male catkins. It is perfectly hardy, and thrives in almost any soil or situation, provided the ground be not too dry. There are several varieties, differing somewhat in size, habit, colour of leaves, &c. In its native country it is said to attain a height of from 80 to 100 feet.

C. obtusa, or *Retinospora obtusa*, is said to be one of the most useful timber trees in Japan; in England it is only of use for ornamental purposes, and should be planted in sheltered spots in a moist, retentive soil. It varies exceedingly under cultivation, some of the forms—*nana* and *pygmæa*—making dense bushes hardly more than a foot in height; these are best planted on rockwork. *Aurea* is one of the best and brightest of Conifers with coloured leaves.

C. pisifera, or *Retinospora pisifera*, also a native of Japan, is distinguished from the last by the feathery appearance of its light fulvous green foliage. There is a considerable number of varieties, which have originated either as seedlings or as branch sports; one of the most desirable and beautiful is *aurea*, with the foliage and young growths a rich golden-yellow. *Filifera* is remarkable for the long, thread-like, pensile branchlets.

C. squarrosa, or *Retinospora squarrosa* is probably only a condition of the last-named species; the branchlets are numerous and spreading, "and with their foliage of a light glaucous green, suffused with a tint of almost silvery whiteness, quite unlike that of any other Coniferous tree."

C. thyoides, the White Cedar of the Eastern United States, is a strong-scented evergreen tree, from thirty to seventy feet high; it is of pyramidal, dense habit, with glaucous green leaves. In its native habitats it affects swamps, and in cultivation thrives best in damp, moist spots. *Variegata* only differs from the type in having about half the branchlets and foliage a rich golden-yellow.

Cryptomeria.—This genus contains but a single species, and is confined to China and Japan. The type is one of the finest of Japanese trees, and is largely planted by the natives. A considerable number of forms have been introduced or have originated in this country. The following are the best:—*Lobbii* has brighter, deeper green foliage than the type, and is more compact in habit, with less pendulous branchlets. *Nana* is a dwarf dense-growing bush, useful for planting amongst rockwork, &c.

Elegans has soft, sharply-pointed, spreading leaves, which are bright green during the growing season, but towards the end of autumn assume a bronzy-crimson colour; this, in comparison with the type, is a small tree. Ordinary *C. Japonica*, in its native country, attains a height of 150 or 200 feet. The Cryptomerias require a sheltered position, and thrive best in moist, deep, rich ground.

Cupressus (*Cypress*).—There are about a dozen species of true Cypresses, natives of the Mediterranean region, temperate Asia, and North America. It is only in the South of England that any of the Cypresses can be fairly depended on; the species here mentioned are probably the hardiest and most desirable.

C. macrocarpa, the Monterey Cypress, in its Californian home attains a height of from 40 to 70 feet. The largest measurement of a specimen of this species is recorded by Brewer, one of the authors of the "Botany of California;" this had a circumference of trunk 18⅔ feet, at a height of five or six feet from the ground. Under cultivation, the Monterey Cypress is variable in habit, but may be readily distinguished from other Cypresses by the very bright green of the foliage. It is, moreover, a fast-growing tree, and a very useful one for the purpose of the landscape gardener in the South and West of England.

C. sempervirens, a native of South Europe, Asia Minor, &c., is generally a tall, tapering flame-shaped tree under cultivation; the variety *horizontalis* only differs in having its branches spreading instead of erect. For a *resumé* of what is known respecting this very interesting tree, and for information respecting famous historical specimens, the reader is referred to Veitch's "Manual of the Coniferæ."

C. torulosa, from the North-western Himalayas, is a tall, fastigiate tree, with glaucous imbricated leaves; although in sheltered spots this makes a fine object, it is inferior from a garden point of view to the two species above-mentioned.

Ginkgo biloba, or *Salisburia adiantifolia*, the Maidenhair Tree, is totally dissimilar in aspect to any other Conifer. It has drupaceous fruits somewhat like those of the common Yew; indeed, it is more nearly related to *Taxus* than to any other member of the Coniferous family which thrives in the open air in Britain. It is a native of Northern China, whence it was introduced to this country about 1754. Good specimens exist in the neighbourhood of London, which have withstood all weathers for a considerable period without injury. The large fan-shaped leaves are much like the pinnules of an *Adiantum* on a large scale. It is probable that this peculiar and handsome tree is not to be thoroughly depended on as hardy except in the southern and western parts of the country.

Juniperus.—Of this genus there are about twenty-five species, which are confined to the Northern Hemisphere, and principally to the colder and mountainous regions. One of the best known is *J. communis*, which has a very extended geographical distribution, and is not uncommon on open hill-sides in Britain. It varies much in habit and other characters—the form found wild in Britain has spreading, straight, pungent, glaucous leaves, and rarely attains a height of from ten to twenty feet; usually it occurs as a bush from two to six feet high. *Hibernica*, the Irish Juniper, has shorter, deeper green leaves, and erect branches with numerous, rigid, close-set branchlets; in habit this is columnar rather than pyramidal. *Nana* is a mountain form of dwarf habit, with shorter, broader, imbricate, incurved leaves. *Sueeica*, the Swedish Juniper, somewhat resembles *Hibernica*, but differs in its lighter green, more glaucous foliage.

J. drupaeea, a native of Asia Minor, is a handsome and distinct plant, with light green pointed leaves, which are broader and stouter than those of any other hardy Juniper; it is remarkable, too, for the large size and deep purple colour of its fruits. Under the most favourable conditions it attains a height of five-and-twenty feet.

J. recurva, a Himalayan species, ranges in height from a few feet to ten yards; it is easily distinguished by its recurved, pendulous, feathery branchlets, clothed with loosely imbricated pointed leaves of a greyish-green colour.

J. Sabina, the common Savin, is a native of the mountainous districts of Southern Europe. It is a dwarf bush of spreading irregular habit, with small scale-like imbricated leaves. *Tamariseifolia* is a form of trailing habit with foliage of a brighter green than the type; *variegata* only differs from the common Savin in having some of the branchlets a creamy-white colour. All are useful rockery plants, or for planting in the front of the shrubbery border; they are readily propagated from cuttings.

J. Virginiana, the Red Cedar, is a very variable species, and one of the most ornamental ones. It is the most widely distributed and one of the most valuable of North American Conifers; the compact, aromatic, close-grained, red heart-wood is largely employed for cabinet-making and for pencils, &c. In its native habitats it sometimes reaches eighty feet in height, but in Britain rarely exceeds half that size. Amongst the best and most distinct of the numerous forms are the following:—*Bedfordiana* has filiform pendulous branchlets, and foliage of a

brighter green than that of the common form. In *glauca*, the branchlets are pale green during winter, but of an almost silvery whiteness in the growing season; *Schottii* is a variety of pyramidal habit with peculiarly bright green foliage. All the forms may be increased from cuttings or by grafting on seedling plants of the type.

Larix (*Larch*).—All the Larches—there are seven or eight species distributed over the temperate regions of the Northern Hemisphere—are hardy in Britain. All are deciduous trees with soft, linear, subulate, light green leaves, and are valuable for landscape effects on account of the peculiar bright yellowish-green tint of the young growths in spring. Of all Coniferous trees, too, the common Larch, *L. Europæa*, is the one which is most extensively planted in Britain. A curious weeping form of this, *pendula*, is well worth growing for ornament. *L. leptolepis* is a Japanese species introduced by Mr. J. G. Veitch about twenty-five years ago; it is inferior in all respects to the common Larch.

L. Americana, *L. Lyallii*, and *L. occidentalis* are North American trees, which are hardly worth cultivating except in collections of trees.

Libocedrus.—Of the eight known species of this genus, only the Chilian, *L. Chilensis*, and the Californian, *L. decurrens*, are hardy enough to merit mention here; the latter is an effective plant with rich dark green foliage. It is quite hardy, with a conical or columnar habit; in a wild state it grows to a height of 100 or 150 feet, with a trunk four to seven feet in diameter. *L. Chilensis* has bright glaucous green, small pointed leaves, with a silvery line on the under side; this is not nearly so hardy as *L. decurrens*, and should be planted in a sheltered situation.

Pinus.—There are about seventy species of *Pinus* distributed over the extra-tropical regions of the Northern Hemisphere. All are evergreen trees with branches more or less in whorls, and needle-like leaves in clusters of two, three, or five. The number of leaves in a sheath has generally been regarded as a character sufficient for the classification of the species; but a few years ago Dr. Engelmann proposed a more natural arrangement, in which the primary character resided in the fruit-scale, and others in the position of the ducts within the leaf, the lateral or terminal position of the cones, &c. Only a few of the most distinct and useful of the hardy Pines are given in the following list.

P. Austriaca, the Austrian Pine, is a fast grower with blackish-green leaves (two in a sheath), four to five inches long. It is a native of Eastern Europe, and thrives in almost any soil.

P. Cembra, a native of Central Europe and Northern Asia, makes, in a wild state, a fine pyramidal tree, sometimes 100 feet high. The leaves—in clusters of five—are from three to five inches long, and are marked with silvery lines. It is a slow-growing but very ornamental tree, either for planting singly or in masses.

P. Coulteri, or *macrocarpa*, is a remarkable Californian tree, with huge cones and greyish glaucous green leaves, in clusters of three, from nine to twelve inches in length.

P. excelsa has slender, drooping, glaucous, bluish-green leaves, five in a sheath, and regularly whorled spreading branches; it is a native of the Himalayan region, and thrives best in light, well-drained soils. In height it ranges from 50 to 100 feet. One of the best of the ornamental Pines.

P. insignis is a beautiful Californian species, with slender, twisted, grass-green leaves, three in a sheath, from four to six inches long. This is the only Pine mentioned in these notes which is not quite hardy; it should be planted in a sheltered position. In the south-western parts of Britain it thrives remarkably well.

P. Laricio, a native of Southern Europe, &c., is a tall, fast-growing tree, nearly related to *P. Austriaca*. It has twisted, glaucous foliage, often six inches long. A curious variety, *pygmæa*, makes a dense dwarf bush.

P. montana is a native of the mountainous regions of Europe, and occurs either as a dwarf, densely-branched bush, or as a small tree; it has short, close-set, dull green leaves, arranged in twos.

P. Pinaster, from the Mediterranean region, is a beautiful pyramidal tree, allied to *P. Austriaca* and *P. Laricio*. In some maritime districts in France it has been extensively planted in order to bind the shifting sands, and the resinous products have given rise to an important branch of industry.

P. Pinea, like the two last-named species, has the leaves two in a sheath. It forms a fine tree, 50 or 60 feet high in its native habitats—the Mediterranean region—but under cultivation in this country rarely attains anything like this size; it, however, makes a handsome and picturesque tree, with a parasol-like head.

P. Strobus, or the Weymouth Pine, from the Eastern United States, is a large tree, from 80 to 150 feet high, and is one of the section in which the leaves are arranged in fives; these are a soft light green, marked with silvery lines, and are from three to five inches long. *Nana* is a small form, with leaves shorter than the type; it makes a dense, compact, bushy shrub.

P. sylvestris, or Scotch Pine, the only Pine which is a true native of Britain, is widely distributed

throughout Europe and North Asia. The type is too well known to need description. *Argentea* and *aurea* are two of the most remarkable of the numerous varieties.

Pseudolarix Kæmpferi, the Golden Larch of Northern China, is a beautiful, deciduous tree, with fascicled leaves, longer and broader than those of *Larix Europæa;* the bright golden-yellow assumed by the foliage in autumn is not less attractive than the soft light yellowish-green of the young growths in spring.

Pseudotsuga Douglasii, better known as the Douglas Fir, or *Abies Douglasii*, is one of the most useful trees which have been introduced to British gardens during the last century. It is a native of North-western America, and is the only species of the genus. There are several varieties, but except in collections of trees these are hardly worth growing. In the Arboretum at Kew there is a fine spar, erected as a flagstaff, which is 159 feet in height; and fine sections of the wood are to be seen in Museum No. 3. Douglas, in whose honour the species is named, and who introduced the tree, thus writes of it:—"The principal part of the gloomy forests of North-west America, in the valleys of the Rocky Mountains, and throughout the interior skirting those mountains, is composed of this species. It attains a height of from 150 to 200 feet, and a circumference of from 20 to 50 feet."

Sciadopitys verticillata, the Umbrella Pine of Japan, is peculiar in foliage as well as in general aspect. The long, leathery, deep glossy green leaves are arranged in whorls at the tips of the branches. In Japan it forms a conical tree, a hundred feet in height, but in Britain it grows slowly, and requires a sheltered position in good soil.

Sequoia.—There are only two species in this genus, the one being the *Wellingtonia*, or Big Tree, and the other the Red Wood of California. *S. gigantea*, more familiarly known as *Wellingtonia gigantea*, is the largest tree of the American forests, and one of the giants of the vegetable kingdom. In the "Botany of California" the following information is given:—"It has an average height of 275 feet, with a trunk 20 feet in diameter, the largest measurement being 366 feet in height, and a diameter of 35 feet, eight inches within the bark, at four feet above the ground." There are several varieties in cultivation, including one with golden variegation, and another with pendulous branches.

S. sempervirens, or, as it is often called, *Taxodium sempervirens*, has dark green, Yew-like leaves, and, in the southern parts of this country, is a hardy, fast-growing, and very ornamental tree. "The forests of this species are economically the most valuable of California, but, owing to their accessibility to tide-water, are in great danger of speedy extermination." In its wild state the Red Wood usually averages eight to twelve feet in diameter, and from 200 to 300 feet in height.

Taxodium.—This genus now contains but three species, two of which are North American, and the third Chinese; the latter is perhaps better known under the generic name of *Glyptostrobus*, but as it is of little except botanical interest, it is not worth further mention here. The only true *Taxodium* in cultivation is *T. distichum*, the Deciduous Cypress, of which noble specimens exist in the grounds at Syon House and elsewhere; it is a handsome, deciduous tree, with slender, spreading, feathery branches, and light open foliage, of a soft bright green during summer, and a dull red in autumn. It is a moisture-loving plant, and should always be planted where its roots can command an unlimited supply of water.

Taxus (*Yew*).—In all probability all the Yews—some authors consider that there are six or eight distinct species—are merely forms of one widely distributed and very variable species. The genus is found throughout north temperate regions to the Arctic circle. Typical *T. baccata* is found in a truly wild state in many parts of Britain. Amongst the very numerous varieties which have either originated in nurseries as seedlings or as branch sports, or have been introduced from other countries, the following are the most distinct:—*Argentea* only differs from the type in the somewhat silvery variegation, and *aurea* in the rich golden-yellow colour of the young branchlets; the latter is one of the most useful and attractive of variegated shrubs. *Adpressa* was for a long time believed to be a native of Japan, but in reality nothing is definitely known as to its origin; it is a very distinct Yew, with short, ovate-oblong, blackish-green leaves and spreading branches, forming a dense flat head; sub-varieties of this are *erecta*, a form of upright habit, and *variegata*, a state in which many of the young branchlets are tipped with creamy-white. *Dovastoni* is a remarkable variety, having longer, deeper green leaves than the common Yew, and pendulous branchlets; there is also a variegated form of this, and both are seen to best advantage when worked on tall stems of the upright-growing type. *Elegantissima* is one of the best of the variegated kinds—a compact, free grower, and constant in its character. *Ericoides* has very small, Heath-like leaves, and is a dwarf-growing bush with slender branches. *Fastigiata* is the well-known Florence

Court, or Irish Yew, and of this there are golden and silver variegated forms. *Fructu luteo* only differs from the common Yew in having bright golden-yellow instead of scarlet fruits; when laden with its fleshy, brightly-coloured fruits, this is very ornamental.

Thuja.—The different species of this genus are perfectly hardy in Britain, and thrive under very varied conditions; some of them are amongst the most useful of evergreen shrubs, owing to the numerous uses to which they can be put.

T. gigantea, a fast-growing, tall, slender tree, with glossy, bright green foliage, is a native of North-western America, where it attains a height of 100 to 150 feet. Under cultivation in this country it is very ornamental, planted either singly or in masses, and is one of the best shrubs for forming quickly a dense evergreen hedge. It does best in a damp soil, provided it is not waterlogged. There are several forms, differing slightly from the type in colour, habit, &c.

T. occidentalis is the common American Arborvitæ of gardens; it has brownish-green leaves, which become browner as winter approaches—it is only in the growing season that the foliage is green. This is found on the opposite side of the North American continent to the previously-named species, and in a wild state occurs in swamps and along the rocky beds of streams. It makes a small tree, with a trunk one to three feet in diameter, and twenty to fifty feet in height. *Lutea* and *Vervaeneana* are two of the handsomest varieties, the young growths being a fine golden-yellow. *Pendula* only differs from the type in its curious weeping habit.

T. plicata, the Siberian Arborvitæ, occurs in Siberia and North-west America. It closely resembles *T. occidentalis*, but is a smaller and more compact tree, more regularly pyramidal in outline, and with shorter branches. Several forms of this are in cultivation, but they are not striking enough to merit special mention here.

T. Standishii is a fine Japanese species with flat, slender, pendulous branches, clothed with closely imbricating, yellowish-green leaves; it is said to attain a height of from forty to sixty feet, according to the soil and situation in which it grows.

Thujopsis is a beautiful Japanese tree, with leathery, bright green leaves—bright green above and silvery beneath. "In a young state, until it attains a height of from fifteen to eighteen feet, nothing handsomer can be conceived; the branches assume a pendulous habit, the lower ones trailing on the ground; when it becomes a tree from forty to fifty feet, its symmetry and beauty are much diminished; the lower branches die off, leaving but a mere tuft at top." It appears to prefer shady moist situations, the foliage being more luxuriant than when exposed to the sun. *T. dolabrata* is the only species; *lætevirens* is a smaller grower than the type, with smaller, lighter green leaves; *variegata* resembles the type in habit, and only differs from it in having the tips of the branchlets pale yellow or cream-colour.

Tsuga.—The plants now placed here were formerly included under *Abies;* there are half a dozen species, two of them Asiatic and the rest North American. The Himalayan *T. Brunoniana* is only hardy in the South of England; the rest are interesting ornamental evergreen trees, well worth growing, and quite hardy.

T. Canadensis is the common Hemlock Spruce; in a young state this is a beautiful tree of pyramidal habit, though less handsome than its near ally, *T. Mertensiana*, which grows to double the size; in a wild state the latter attains a height of from 100 to 200 feet, whilst the former hardly exceeds from seventy to eighty feet.

T. Hookeriana and *T. Pattoniana* are two nearly-allied plants; the first-named has glaucous, somewhat silvery leaves, whilst the latter has light green foliage.

T. Sieboldii is a beautiful small-growing Japanese tree, with the habit and general aspect of the Canadian Hemlock Spruce, but with larger leaves of a brighter and more cheerful colour.

THE HARDY FRUIT GARDEN.

By D. T. Fish.

THE FIG.

A MAJORITY of the failures in the out-door culture of the Fig have arisen from a slavish adherence to in-door methods. Hence the wisdom of starting on a radically different tack. For example, under glass, as Mr. Coleman has shown, two or more crops a year are the rule, in the open air one only. Under glass the young shoots should be stopped once or several times, out of doors they are best unstopped. In-door Figs in full bearing can hardly be over-fed or over-watered; in the open air, a starving regimen is the key to success. Under glass, good soil and liberal top-dressings are useful; in the open air, the soil cannot well be too poor or too dry.

Site and Soil.—The warmer and drier the former the better. A south wall, and a sloping bank, with a sharp pitch to the south or the south-west, thoroughly drained, forms the best site. The

soil can hardly be too poor and porous. A mixture of light loam, lime-rubbish, and smashed brick, two parts of the former to one of the latter, or the two in equal quantities, is best. A depth of two feet is sufficient. Some of the best Figs ever grown by the writer were planted in a paved yard, without any preparation whatever. A few paving-stones were lifted, the roots planted, and the stones replaced a month or so after planting. And the Fig-trees so planted have borne good crops for twenty years. They were trained up the front of stables, and over the roofs, and left to shift for themselves for food under a paved yard, over which more than a hundred tons of coal were carted annually.

This may seem an extreme example of a starving regime, but it reveals the way to success in ripening good crops of Figs in our climate.

Training and Treatment.—There seem but two possible methods of top-treatment that can result in good crops of Figs in the open air in our climate. The one is the coddling, and the other the hardening system.

The chief points in the first are to keep the shoots thin; that is, to prune and train them on the fan-system, something like Peaches, but with wider spaces—say a foot—between the branches. Then, before the approach of winter, the whole surface of the trees is thatched with reeds, straw, or branches, and covered with mats. Another plan of protecting Fig-trees in the open consists in detaching them from the walls, tying all the branches together into one bundle, or two of about equal size, binding them round with straw or mats, and fixing them *en masse* to the wall, or stout stakes, for the winter. The trees by either of these methods are preserved from frost until March, or even later, according to the season. They are then uncovered tentatively, left for a time untied after being uncovered, and finally trained afresh over the wall when all danger of injury from severe frosts is over. The weak link in this mode of culture is the sudden transition from the covered to the uncovered state. And failure has so frequently resulted, that this mode of culture has been very generally given up in favour of what may be called the hardening process.

This should begin by confining each tree to a single stem. The stem may be of any handy height, from six inches to a yard. Its chief object is to get rid of suckers, and confine the trees, large or small, to one root-stock. This is the first step towards fertility. And as to training, the horizontal system is the best for trees of any considerable size.

There should be *no pruning*. Should the branches start too strongly at first, pinch out the leading shoot when it has made from four to six leaves. This will force all the buds into shoots, which will probably suffice to lay the foundation of the future Fig-tree. But should this not prove to be the case, then stop the second, or even the third crop of branches, until a sufficiency of shoots are produced to form the tree. So soon as the foundation is thus laid, and future furnishing in plenty provided, the stopping of Fig-branches in the open air should cease.

All these preliminary stoppings may be avoided, much time saved, and greater fertility established and maintained, by planting Fig-trees at once a yard or more apart for this hard system of treatment, for the surest mode of securing good crops of Figs in the open air consists in letting them alone. Fix the branches firmly to the wall or building, and let them grow or ramble as they list. They will soon get into fertile ways, and make but little growth. The shoots will be short-jointed, the leaves small, and the fruit numerous. The wood under this let-alone principle also matures so thoroughly that our ordinary winters do it no harm. Leave the Fig-trees wholly to their fate, which as a rule is a perfectly safe one.

The embryo Figs formed on the young shoots during the previous autumn mostly perish, though many of them may pass through mild winters unharmed. But the cultivator on this system does not rely on these for a crop. On the contrary, he mostly picks off all Figlets the size of Filberts before the winter. When the young shoots break in the spring, from one to three, or more, young Figlets come forth almost abreast of, or beneath, the leaf-stalks. These furnish the crop that ripens during the succeeding summer, and all Figs in advance of these, as well as all that come after, are useless in the open air. One growth a year, and one crop, must be the motto of the successful Fig-grower in our climate.

But these unstopped growths will have a tendency to get away from the wall? They have; and this in not a few localities adds to the fertility of Figs in the open air. In colder situations they may be tied closer in for greater warmth. Gable-ends facing south, and with a chimney running up them, furnish the best possible sites for open-air Figs.

The roofs of houses with a southern or other warm exposure also suit them admirably. But it is needful to arrange a simple wire, wooden, or other frame, or trellis, so as to lift the trees a foot or eighteen inches above the roof. Otherwise the fruit, and even the leaves or branches, are apt to get scorched. Figs lying on roofs would also decompose almost before they were ripe during wet weather.

General Culture.—This consists in letting well alone, except an occasional removal of a few

weakly boughs, or the cutting back of a shoot or branch to keep the lower or any thin part of the trees fully furnished with bearing branches; and, probably, in intensely hot seasons, one root-soaking of sewage or manure water. The latter, however, may not be needful oftener than once a year, or in half a dozen years.

Protection from Insects, Birds, Rats, Mice, and other Vermin.—Ripe Figs are among the most luscious of all fruits. Hence the numbers and persistency of their enemies as they reach maturity. Hence, too, their various saviours, such as muslin bags, &c. Most of these are shams, and worse than useless. Wasps, hornets, even blue-bottles will nibble or find their way through muslin bags, with amazing rapidity, when and where a luscious Fig is within such an easily-measurable distance of them. Rats and mice have a mania for ripe Figs, and scoop them out, or totally devour them, with wonderful celerity. Blackbirds, thrushes, robins, and most other birds, are also terribly sharp-set on luscious Figs, especially during dry, hot weather.

The best, and in fact only sure remedies, consist in the diminution of the number, or total destruction, of these and other enemies of the Fig, amongst which must also be reckoned ants and earwigs. A covering of a sort of canvas, or coarse muslin, known as cheese-cloth, kept quite clear of the fruit and leaves, also baulks the insects and birds. If the fruit are bagged in textile protectives, it is essential to safety to insert wood or wire hoops inside the bags, to keep them free of the fruits at all points.

Should the foregoing methods for moderating and maturing growth, and heightening fertility, fail, there is no better or more prompt remedy for over-luxuriance and sterility in Figs than root-pruning, say early in October. But with the hard, poor, comparatively dry root-runs, and the multiple growths of as near as may be equal strength and moderate size, fertility will become continuous.

Varieties.—As to varieties, the very best for out-of-door culture are the Brown Turkey, *alias* Lee's Perpetual, the Brunswick, and the White Marseilles. But the first is the best, and if not quite so hardy as the larger Brunswick, is so much more prolific, that if only one Fig is cultivated, the Brown Turkey should be that one. Those who wish for a greater variety may readily add to their collection from the list of Figs under Glass.

THE QUINCE.

The Quince is less popular and generally used than formerly. It is a native of France, Italy, Germany, and also of Sussex, and other parts of England. It forms a dwarf, wide-spreading tree, rising to a height of from twelve to twenty feet. The stem is mostly bent more or less, the bark smooth when young, rough when old. Growth is rapid during its young state, but very slow after getting into full-bearing condition. It is a late-flowering tree, its large French-white flowers opening in June. The Quince has thus a far better chance of setting a crop of fruit than the Pear, and in proper position, and with good or even indifferent culture, the Quince proves fertile as a standard or bush-tree. The fruit ripens late, of a rich golden colour, highly perfumed. The fruit is, however, harsh and austere, and is uneatable in a raw state.

The chief uses of Quinces are to cook with Apples in pies or puddings, stew with Pears, be added to Pear pies, and converted into jam or jelly. As, however, one Quince quartered in an Apple-pie is sufficient to impart its aroma, no great quantity of Quinces need be grown in any one garden or orchard, unless indeed they are cultivated for sale, converting into marmalade or other preserves, or making into wine.

The use of the Quince as a stock for Pears is a comparatively modern one, and in olden times, and especially in Italy, the Quince seems to have been more popular than the Pear. Now, however, far more Quinces are used as foster-mothers for Pears than for any other purpose. The Quince is also used as a stock for other plants, such as the *Pyracantha*, *Cotoneaster*, *Pyrus Japonica*, and others.

Propagation—The Quince can be propagated by seeds, grafting, and budding. But, unless for stocks, it is seldom raised from seed, for two reasons—chiefly because it seldom ripens them freely in our climate, and neither of the varieties can be depended upon to come quite true from seeds. Again, Quinces really thrive best on their own roots, and hence there is little inducement to bud or graft, though the Quince may be propagated by both methods exactly the same as Pears. Quinces may also be budded or grafted on the common White-thorn, or seedling Pears. Cleft-grafting in March or April, or budding in July, are the most suitable seasons for thus propagating the Quince.

As layers, however, may be had in plenty, and cuttings also root freely, these are almost the only methods of propagation employed for fruit-bearing trees, and both are also largely employed for the rapid multiplication of stocks. Cuttings from nine inches to a foot long, heeled off the old wood if possible, should be inserted in the autumn from six inches to a foot apart, and two feet distant between the rows. Insert about six inches deep, making the

base firm, and the majority of the cuttings will have made sufficient roots and top-growth to be budded or grafted in two years, or planted out into their fruiting position in three years from the time of insertion.

The layering of the Quince for propagation does not differ from that of the Rose, &c., already described. Some, however, prefer cutting back the Quince stools in the spring or the autumn, which results in a vigorous growth, and these shoots are earthed up next season within an inch or two of the summit of the young shoots. The latter root almost as freely thus as when each separate shoot is layered or pegged down, as in more elaborate layering. After a year's growth earthed up on the stools, the rooted layers are removed, and lined out in nursery rows, or finally planted out in their fruiting quarters.

Soil.—The Quince is by no means fastidious about this. It is a free surface-rooting plant, and roots most readily in light rich soils, and in damp situations. Though some of the finest Quinces are found contiguous to running streams or ponds, yet the tree will not thrive or ripen its fruit in undrained borders or orchards. The best site, as a rule, is a cosy nook or corner in the shrubbery or pleasure-ground, or flanking the orchard. When grown on a wall it may be treated exactly as the Pear.

Pruning and Training.—The chief point for standard trees is the obtaining of one tolerably stout straight stem to support the tree, and mould it into more or less of symmetry. Sometimes rather severe cutting back results in a strong break that runs into a good leader. At others a stout stake, and a considerable amount of pruning and training, are needed to get a good base.

Heights of from five to eight feet, with a foot or two less in breadth, form trees at once highly ornamental and useful. The chief attentions needful after the trees have grown into full size and fertility, are the removal of any weakly or useless branches, the thinning of the fruit when the crop is excessive, and heavy watering during excessively dry weather.

Gather the fruit carefully so soon as it becomes ripe, and before it falls from the trees, for though hard it is easily blemished, and the bruised portions quickly decay. The fruit, however, is seldom fit to gather before the beginning of November. It should be stored in a dry shed or cellar, or outhouse, by itself, as the aroma of Quinces is too powerful to be pleasant, and is communicated to other fruit or substances near to them. The fruit will seldom keep longer than four to six weeks, and are mostly in their best condition for converting into preserves about three weeks after gathering. Those who are so fond of Quince as to consider Apple-pies imperfect without them, may preserve their Quinces in bottles, either whole or quartered, for these purposes.

Varieties.—Practically there are but three sorts worth growing—the Apple, the Pear, and the Portugal, though a fourth, Rea's Mammoth, is much grown in America. This is not only larger than the Portugal Quince, but is so mild and tender that it can be eaten raw. The Apple Quince is the hardiest and most prolific, fruiting freely in localities in which neither of the others does much good. The fruit is nearly round, and of a deep golden colour when ripe. The Pear Quince is of the form of the majority of Pears, sometimes, however, roundish like the Apple, and more or less ribbed towards the eye. It is more of a lemon than golden colour, is larger than the Apple Quince, and also later in ripening. The Portugal is a much larger variety than the common Pear Quince. It is also of better quality, and milder flavour, and the flesh changes to deep red when cooked. Unfortunately, the Portugal variety is a shy bearer, which prevents its being so generally grown as the others. It is, however, from its free growth, much used for stocks, and also for planting in shrubberies and pleasure-grounds for ornamental effects.

OPEN-AIR GRAPE-VINE CULTURE.

This has rapidly retrograded in England within the last half-century. The abolition of the duty on glass gave such an impetus to the multiplication of Vineries, and other glass houses in which Vines could be grown, that out-of-door Grapes were almost "glassed" out of cultivation. This is to be regretted alike on social, sanitary, and horticultural grounds. For the growth of Vines in the open air interested and pleased large classes who are not likely to be able to grow them under glass, while it also brought edible Grapes within reach of not a few that are not likely to be able to secure many of those grown in Vineries. Tested by size they are very inferior, but by quality, the only sensible test, Muscadines, Sweetwaters, and even Frontignacs and Hamburghs, from south walls, not seldom equal or excel the same varieties from Vineries.

In general terms, Grapes may be ripened in the open air in average seasons, and under favourable conditions, south of London. Excess of moisture rather than a paucity of warmth is the most frequent cause of failure. Hence the larger amount of success in the open-air culture of the Grape in the Eastern than the Western counties, though the latter enjoy the higher temperature.

Dryness and warmth may be said to be the chief factors in the production of out-of-door Grapes, and these may be augmented by artificial means, such as thorough drainage, raised borders, excessive porosity of soil, &c.

Three Practical Methods of Cultivating the Grape-vine in the Open Air.—The first is on south walls, the second in ground Vineries, and the third on warm borders in the open, trained to stakes like Raspberries, or as ground cordons, within six inches or a foot of the ground. A fourth possible method may also be noted, that is, to grow Vines in pots, or tubs, in the open, for the clothing of walls, the draping of windows or verandahs, and in favourable positions also ripening some eatable Grapes for dessert. The Grape-vine treated thus will be second to no other plant for its beauty of striking leaves and tendrils, while its flowers rival the Jasmine in fragrance, and its fruit excels that of most berry-bearing climbers. So that, should it fail to ripen its fruit, nothing would be lost in growing it in the positions indicated as a fine foliage plant. But the heat and aridity of not a few balconies would be the likeliest means of maturing out-of-door Grapes, especially as these often succeed best in the most unlikely places.

The Checking of Excessive Growth.—This is full half the secret of success in the culture of out-of-door Grapes. The stronger they grow, as a rule, the fewer and the worse the Grapes they ripen. Poor, fleet, dry, warm borders, and a starving regimen, are among the most potent means of forcing moderate growth. The fat borders of the inside Vinery must be wholly ignored in the Vineyard in the open. As to depth, eighteen inches or two feet, on a porous or impenetrable base, are sufficient. Dryness must be insured either by a porous bottom or an impervious top, or both. The last has not seldom succeeded in growing and ripening good out-of-door Grapes when all other means have failed. The surface has been laid on a sharp pitch, and covered with three inches of impenetrable concrete, that has shed the rainfall right off the border, and the Vine-roots left to get moisture by capillary attraction, or other means. That they obtained sufficient is abundantly proved by the satisfactory produce. To leave the roots to themselves for periods of three, six, ten, or more years, may be defined as the extreme of the dry system for out-of-door Grapes.

The warmth of out-of-door Vine-borders may be greatly increased by such modes of culture, also by giving the borders a sharp pitch to the south, and especially by shedding off all the rainfall by surface concreting, or coverings of tarpauling, zinc, corrugated iron, or wooden shutters, from October to May. Where expensive methods are not adopted, much may be done to shed off the cold rains by laying the border on a sharp angle, and preserving the surface smooth and hard. Three-fourths of the cold autumn, winter, and cold spring rains will thus be pitched off. Coverings of litter in the early autumn, and the making of borders frost-proof until the end of May, also do much to husband the heat of the previous summer, and to start the border abreast of the warmer atmosphere and augmented heat of the succeeding June.

Summer Stimulation.—Having insisted on the necessity of poverty, fleetness, dryness, and warmth of root-runs, it may be needful at this point to give a caution against carrying any of these qualities too far. As a rule, the Vine will carry its large spread of leaves and branches, and swell and finish its fruit, without any special assistance. But during long spells of drought, and under heavy crops of fruit, it may be needful to turn a river over these fleet, dry, hot Vine-borders for five or ten hours at a stretch, until every root-fibre is fully soaked with water, clean or foul, such as sewage. With an average amount of rainfall fairly distributed this will not be needed; but should little fall during June, July, or August, one, or even two such thorough waterings should be given, and a slight surface mulch of dung after the watering might prove useful. But these are exceptional baits, and not to be looked upon as the regular feeding of Vines in the open air.

Top-treatment.—Some recommend close planting, as is mostly practised in France, where the Vines are treated as a sort of multiple cordons, and planted from eighteen inches to a yard apart. But Vines in our climate fruit more freely, and ripen more perfectly, when their heads are allowed to run over very considerable areas. The top-growths powerfully assist in keeping the root-runs poor, and the two work together to increase the fertility.

Training.—The most common method of training is either horizontal or vertical, or a mixture of both. The start is mostly the same in either case. Vines planted in October or November will mostly be cut back to two or more eyes, say in January or February. The two shoots starting from these will be trained one to the right, the other to the left, within a foot, eighteen inches, or two feet of the base of the wall. These will be allowed to run on, till they meet the next Vine, planted say from three to fifteen or more feet from it. When the shoot meets the next Vine, or runs a distance of

five or more feet, it is good practice to stop it. This plumps up the buds behind right back to the base of the shoot, if it has not run too far. At the winter pruning the shoots may be left intact, or cut back a third, one-half, or two-thirds, according to the distance between the Vines, space to be filled, &c. The next year all the buds left may be allowed to break into shoots, and trained vertically up the wall. Or, more probably, every other bud, or two out of three, may be rubbed off, and the shoots from those left trained at right angles with the horizontal branch. The vertical shoots should hardly be closer than eighteen inches; two feet would probably be better. So soon as these shoots make two feet, or at most a yard of wood, they should be stopped. From this stage it would only be needful to extend the vertical branches at any ratio of progress thought best, until the summit of the walls or dwelling-house were reached.

The horizontal method of training the Grape-vine on walls, fences, and dwelling-houses, hardly differs from that already described and illustrated for Pears. Horizontal branches are swept across the wall at any convenient distance, from eighteen inches to three or five feet, and from these vertical branches are led up at a suitable distance, as in vertical training, until the next cross-branch is reached. Each of these vertical branches may be spurred in from base to summit, and kept so during the life of the branch, or of the plant. Or greater vitality and variety may be infused alike into the Vine and its produce, by cutting half the vertical branches right out annually, and thus alternating a bearing rod and a young shoot all over the area of the Vine. No bearing rod would thus bear more than once, and the whole Vine would be converted into a series of short rods, producing a crop of wood and of fruit alternately. This would get rid of the stunting effects of close spurring—often, however, most essential to fertility in the open air—and would encourage far more growth than would be possible under the close-spur system.

The stopping and pruning of Vines in the open air are far more simple and easy operations than the same processes under glass. Vigorous disbudding should be practised so soon as the berries are set. Long before this all weakly and worthless buds should be rubbed off, and the crowded clusters of buds or branchlets thinned out. One fair bunch to a spur, or at most two, where the spurs are rather wide asunder, as is the case at times under the long or short rod system of pruning and training, yield a full crop.

Soon after the berries begin to swell, thin out every other one, or two or three to one left, according to variety, perfection of setting, &c. This will permit the berries to swell to a fair average size, and immensely improve the quality of the Grapes. Grapes grown for wine need not be thinned, though it would pay well to thin those, thus largely increasing the percentage of juice to waste. Stop the fruiting shoots two, or at most three leaves beyond the bunch. This will greatly enlarge the foliage in close proximity to the fruit, and thus provide it with better supplies of food. Train in neatly the leading and young shoots for next year; cut these back, if needful, to afford more light, heat, and air to the ripening fruit.

As they approach maturity protect from birds, flies, or other vermin, or cut with a portion of wood attached, and keep in a cool, sweet, fruit or other room until wanted.

The Vines may be pruned so soon as the fruit is gathered, early pruning being, on the whole, best adapted for Vines in the open air in this country.

Vines in what are called ground Vineries are mostly trained to a rail within a foot, eighteen inches, or two feet from the ground. The ground Vinery is a triangular roof of glass, two or more feet wide at the base, and eighteen or more inches high, set upon one or more bricks laid along either side in a continuous line, or three or four bricks at regular distances in the length of the Vinery, according as more or less heat is desired. A continuous line of bricks would make the sides of the Vinery nearly air-tight, while a few piers would convert the interstices between into open ventilators. The tops are not lifted off unless to afford the necessary attention to the Vines. Even this may be rendered unnecessary by making one side of the Vinery movable.

It is astonishing what a fostering and forwarding power these ground Vineries exert when placed across a sloping bank, with a rapid pitch to the south. They may be placed in rows across the bank at intervals of six, nine, or twelve feet, according to their width. Many varieties of Grape ripen well beneath these useful contrivances, which fail to ripen on southern or western walls.

Grapes may also be ripened on rails as above, without the aid of ground Vineries, in warm and sheltered localities, and the writer has seen an entire border twelve feet wide, covered with cordon Vines at distances of six feet apart, and nine inches from the ground, that ripened well during most seasons.

A yet simpler method of growing Grape-vines in the open air consists in planting and treating them exactly as Raspberries. (See Raspberries.) A south border, backed by a wall ten or twelve feet high, furnishes the best site for such a Vineyard in the open. True, such Vines very seldom ripen fruit of large size. But such hardy and useful

varieties as the Claret, Dusty Miller (Miller's Burgundy), and the White and Black Cluster, may be sufficiently ripened for wine-making in many warm nooks and corners.

The pot, or tub, culture of the Vine in the open air is highly favourable to its fertility. All those conditions already insisted on are more easily insured within such areas than in the open ground, as in pots, or tubs, the roots are under complete control.

Among high-coloured-leaved varieties worthy of growing for their foliage alone, the following are some of the best:—

Alicante.
Barbarossa.
Claret.
Lady Downs.
Miller's Burgundy.
Parsley-leaved Muscadine.
West St. Peters.

And many of the American species and varieties.

For fruiting the following are the best varieties, in addition to those already named for wine-making, and the different varieties of Muscadine and Sweetwater:—

Black or Purple Grapes.

Black or Grizzly Frontignac.
Black Hamburgh.
Black July.
Black Prince.
Black Sweetwater.
Cambridge Botanic Garden.
Esperione.
Madresfield Court.
Purple Fontainebleau.

White Grapes.

Chasselas Musque.
Chasselas Vibert.
Early Saumar Frontignac.
Early Smyrna.
Early White Malvasia.
Frontignac.
Scotch White Cluster.
Stillward's Sweetwater, the best, the hardiest, and freest-setting of all the Sweetwaters.

There are other varieties that have been ripened successfully on warm walls, and among them the Grizzly Frontignac, which seldom or never shanks in the open air.

Diseases and Insects.—With the single exception of mildew, and occasional cracking of the berries after sudden and severe alternations from drought to moisture, or fierce heat to cold, neither insect nor diseases attack the Vine in the open air.

During wet, cold springs, and again in the autumn, mildew not seldom attacks the young shoots, and the swelling berries; and sulphur dustings overhead are the only means of keeping this disease in check, or effecting a cure. It is a curious fact that Grapes in the open air seldom or never shank, and that the natural enemy of the Vine under glass, the red spider, or that scourge of the Grape-vine on the Continent, the Phylloxera, is never met with in the open air in this country. It may also be added that while south or south-east walls, or borders, are the most favourable for the perfect ripening of Grapes in our climate, nevertheless any aspect from east to south-west will sufficiently ripen them for wine-making throughout large districts.

THE MEDLAR (Mespilus Germanica).

Medlar jelly is tolerably well known, and almost universally appreciated, while the tree itself, and its fruit on the dessert-table, are but seldom met with. Clothed with a profusion of white flowers posted near the points of the shoots in the early summer, the tree is as striking and showy at a distance as a wild Rose. The broad spread of leaves, habit, colour, and form of the tree, and its rich autumnal tints, are likewise unique and striking. The fruit, where known and properly cultivated and eaten, is also generally liked; and not a few, when once they acquire the taste, become possessed of a passion for Medlars, and eat them in season and out of season. In the jelly state, however, Medlars may always be had, and many prefer it to the famous Guava jelly.

The fruit should be gathered towards the end of October or beginning of November, and before it is severely frozen. It will then be quite hard, and probably more or less green. Laid out on shelves in a cool dry place, it will ripen, that is, "blet," or partially decay, in a fortnight or so. When it becomes brown and soft it is fit to eat, or to convert into jelly. Medlars may be kept from November to February. For the latter very dry storage is needful, and some recommend dipping the stalk of each in brine before storing, as a means of checking or preventing the development of white fungi, that mostly originate near the stalk, and quickly overrun the Medlar, to the destruction of its flavour, and the rapid decomposition of the fruit. But the safer plan is to eat as many as possible during the two or three months Medlars may be kept in season, and convert the surplus into jelly within a month or so of the time of gathering, and before the fruit have been deteriorated by fungoid growth.

Propagation.—Practically there are but two easily practicable modes of propagating Medlars. These are by budding or grafting. Any of the usual methods so frequently adverted to, or described, will answer, budding with a dormant eye, and the use of scions of moderate size, on two-years-old wood being preferred. The Pear is preferred even to the wild Medlar for a stock, the Quince and White-thorn also answering well. Cuttings of Medlars root so badly as to render that mode of propagation virtually useless. Though the Medlar seeds plentifully—each fruit, as a rule, producing five seeds—most of them take two years to vegetate; and there is no advantage in raising Medlars from seeds, especially as the wilding Pear,

common White-thorn, or even the Quince suits it as well or better. The Medlar is not particular about soil, though a rich unctuous loam suits it best. Like the Quince it also thrives best in a rather moist situation. As it does not bloom till the end of June, or even July, it seldom misses a crop, and the crop should not be gathered till the end of October.

Medlars thrive well in groups, or singly on lawns, or in orchards, or the fruit garden. The best form is a spreading bush resting on the turf, or neat standards from a yard to five feet high. Where planted in lines, or in quantity, they should hardly be closer than from fifteen to twenty feet. When once established they need but little pruning or training; some varieties, however, requiring more than others.

As to varieties, only three sorts are generally known and grown: the Nottingham, or Common; the Dutch, or Large Dutch; and the Stoneless. The Dutch is the most dense-growing variety, and needs the most pruning or training. But Medlars, if left to themselves have a method of throwing their long semi-dependent boughs outwards, and the weight of their branches, as well as of their fruit, gives a graceful far-spreading habit to the tree, which keeps it from being over-crowded, and exposes the fruit that rest on the upper surface of the boughs to the full effects of light and air. The Common, or Nottingham Medlar, while the smallest, is decidedly the best-flavoured. The Dutch, however, being about twice as large as the Common, is more generally grown, but is inferior in quality for either jelly or dessert.

The Medlar.

The Stoneless Medlar is without seed, and the smallest of the three, seldom exceeding three-quarters of an inch in diameter. Being almost wholly edible it would, however, be more generally grown were it not inferior in quality to the other two.

Diseases and Insects.—So far as the trees are concerned, they enjoy perfect immunity from both. The fruit, however, as already hinted, are subject to the attacks of fungus, especially in wet seasons and localities. This never attacks them, however, until they reach the bletting, that is, the edible stage. A dry atmosphere, such as that of an early Vinery, emptied of all plants, and subjected to occasional fire-heat, with a constant circulation of air, is the best antidote. A dip of the stems in brine, or strong lime-water, or a slight dredging of dry sulphur finely powdered, is useful in arresting the spread of the fungus, and helping to preserve the fruit.

THE MULBERRY.

This semi-classical tree was far more popular and generally grown some two and a half or three centuries ago than it is now. At that period it was tried extensively as the basis of a British silk industry, and failed. The majority of our noted old Mulberry-trees come down to us as waifs and strays of a mistaken commercial enterprise, rather than survivals of a period when the Mulberry was generally grown in England for its fruit.

Few trees are more brittle, or more readily rent asunder by snow in winter, and wind and rain in summer, than the Mulberry, and in the case of not a few of the most ancient trees little or nothing of the original trunks remains. As time and stress of weather have wrecked and laid low the old trunks, other suckers and boughs have sprung forth from the root-stock, and grown into newer and younger trees, that in turn become venerable boles or trunks in the old places.

Mulberries resemble Blackberries in form and flavour more than any other fruit, and ripen from August to October, and thus afford a rather long succession. The berries must be quite ripe before they are eaten, and the simplest way of gathering them is to hold a clean cloth under the tree, and gently shake the branches, repeating the process daily, and thus only ripe fruit will be gathered, and all the ripe ones. The latter fact is important, as Mulberries are hardly edible until quite ripe, and

very few fruits become unfit to eat from over-ripeness in less time after they are gathered.

The Mulberry is the latest tree to break into leafage, remaining bald and bare until the end of June in many localities. It is so hardy in all the warmer districts of England south of London as not only to withstand the severities of our climate, but ripen fruit as a standard in favourable seasons. It even ripens in favourable localities in Yorkshire; but in cold districts, or in Scotland, the Mulberry needs warm sites and the fostering of a wall to ripen its fruit in the open air. The necessity of its leaves for amateur attempts in silk-culture has given it an importance beyond its mere edible qualities; hence it may be well to give fuller instructions for its propagation and culture than would otherwise be needful.

Propagation.—This may be effected by all the methods enumerated for that of other fruit, and by one method in addition, that has not yet been described—viz., by *truncheons*. A truncheon in our special sense is simply a portion of a bough of any handy length, from one yard to four. Remove such boughs in October or November, reduce a few of the smaller branches, and insert the thick end a foot or two feet deep into the ground, tread home firmly, and if very large and at all top-heavy, reduce considerably, and place a stout stake against the truncheon to make and keep it immovable. During the next summer the truncheon is converted into a rooted Mulberry-tree.

Cuttings.—The simplest mode is by placing these in the open air, the cutting simply differing from the truncheons in being smaller. Strong shoots of the last year's wood from a foot to two feet long, heeled off with a base of older wood, and firmly placed in the ground, form the best cuttings.

Mixed Hot and Cold Method of Rooting Mulberry Cuttings.—Insert the cuttings in the open air as before, say in October, and leave them there till March or April, when a callus will be found forming around their base. Pot them up in sandy soil, place in a close frame with a bottom heat of 65°, grow on under glass for a couple of months or so, and then plant out, and thus make the progress of two years in one. Summer cuttings may also be heeled off when the trees have broken into leafage, inserted in sandy loam, and placed in a moist atmosphere and a temperature of 65° till rooted.

Layers.—Wherever the branches of Mulberries can be made to touch the earth, either by accident or design, they root rapidly, and thus form excellent plants. Pots may also be fixed up against the branches to be rooted, the only objection to this method being the labour of keeping the soil watered until the layers are rooted.

Suckers.—Trees raised from suckers are relatively *sterile*. This correlation between suckers and sterility is by no means confined to Mulberries, though it is more pronounced in regard to these than to most other fruits.

Grafting, *Inarching*, and *Budding* are all practicable—the first and the third, however, by no means so easy and certain in the case of Mulberries as of most other fruit-trees. Inarching involves a useless loss of labour, and of vital force, when other and so much easier and swifter methods of propagation are available.

Seeds.—This method is liable to similar objections. Though the Black Mulberry comes true from seeds, and vegetates under favourable conditions within six weeks or two months, yet it takes the seedlings some years to grow into fruitful plants, and a very large percentage of the seedlings are apt to continue sterile for indefinite periods.

If this method is to be adopted, separate the seeds from the pulp by bruising and washing, then dry, and sow either at once or in the spring. If at once, sow thinly in light soil, cover with the same, and place in a gentle hot-bed. Winter in a temperature of 55° or 60°. Prick out, grow on, harden off, and plant out the seedlings in June or July. Or sow thinly out of doors in June, leave in the seed-bed for one or two years, line out, and grow on in rows until large enough to plant out. During the first winter in the open air, seedling Mulberries should be protected with mats, screens of boughs, or glass.

Planting.—This resolves itself into matters of time, soil, site, and depth. The *time* is unique among fruit-trees, as the Mulberry seldom puts forth its leaves until June. April is probably the best time to plant the Mulberry.

As to *soil*, the finest Mulberries in the open ever seen by the writer were grown in the dark, black earth only to be found in old kitchen gardens. It also thrives well in rich deep loams.

The *site* should be warm, and sheltered from high winds. The tree, though it bears our climate, is decidedly tender. It lives here obviously owing chiefly to its lateness. It only grows in the warmest months of our summer. But it loves heat, and various means should be adopted to give it the full benefit of all the warmth we can command. The practice of turfing over the roots of Mulberries is the very worst that could be devised. In cold localities the only chance of ripening Mulberries in the open air is to plant them on south walls.

The Mulberry is rather a deep and strong-rooting tree, and thrives best on borders from two feet to a

yard in depth. Poor, shallow, gravelly or chalky soils are almost as unsuitable as wet sour clay. Any check for lack of water or food mostly results in the loss of the crop. Hence the importance of copious supplies of water in dry weather, and of choosing somewhat moist localities, so well drained, however, as to render any stagnant water at the roots impossible.

Pruning and Training.—Very little of either is needful after the trees get established. The best form is that of round-headed standards, with a stem ranging from three to six feet in height. Attempts have also been made to mould the Mulberry into pyramids, but these have not been very successful in the open air. The standard form kept rather open suits the style of the tree better. Mulberries, however, are also at times fruited on espalier rails, and on walls; and in such case they may be pruned and trained like Pears or Peaches, and bear close spurring fairly well.

General Culture.—This may be said to consist chiefly in the full development of individual trees. Abroad they are crowded together almost as close as Willows by the sides of water-courses: here the trees are mostly giants of their kind, and few and far between. Climate as well as purpose accounts for the wide difference. Abroad Mulberries are chiefly grown for their leaves, at home for their fruit, and the amount of the latter is very largely determined by the size and age of the Mulberry-trees. The older and larger, the more fertile, and in most localities age is essential to fertility. The fruit is also, as a rule, far higher-flavoured on old trees. No special root-culture, such as surface mulchings with composts or manure, will be desirable. It is good practice, however, to allow the leaves to lie as a natural mulch over the roots in the winter. Or, if these are considered unsightly, a couple of inches of cocoanut-fibre refuse is equally or more useful. During long spells of dry weather a soaking of weak sewage or other manure water may also be useful. But planted in good kitchen garden earth or loam, such as here recommended, the Mulberry-trees mostly take care of themselves and furnish fair crops annually.

Varieties.—Practically there is but one worth growing for its fruit, the *Morus nigra*, or Black Mulberry. The Red Mulberry, or *Morus rubra*, is equally hardy, grows stronger, and forms a larger tree. The fruit is also larger, but its red colour and inferior flavour are against it. The White Mulberry, being a native of China, is equally or more hardy, and is, probably, more grown as food for silkworms than the Black. But the fruits are useless in the open air in our climate, though a few trees may be planted in shrubberies, in which its light-coloured and fine foliage has an unique effect.

Diseases and Insects.—The tree may be said to be wholly free from disease in our climate, and as for insects, though the leaves are the natural food of the caterpillar of the silkworm, no other grub, worm, or insect is known to prey upon them.

Mulberries, however, as already observed, are specially liable to accidents, and such fatalities as stem-rending and branch-snapping are very common among them. These may be guarded against by modes of training and mechanical supports. No main branch should proceed from the bole at right angles; on the contrary, it should proceed for some distance almost on a parallel line with the bole, then gradually diverge into a fork, thus giving the greatest strength to the branch to resist the pressure of snow, rain, or wind. In addition to such safeguards against breakdowns, it is wise to loop all the main limbs to each other and to the bole when practicable, with chains or iron hoops. By carefully attending to these, and lengthening them as the branches grow, they may be made to afford the needful security without biting into, or partially through, the branches or bole of the tree. But even where this takes place the Mulberry-tree seems little the worse for iron rods and bands, and there are comparatively few venerable Mulberry-trees that have not more or less of iron running through or round their boles, trunks, or branches.

Culture under Glass.—The Mulberry is admirably adapted for cultivation in orchard-houses, alike in pots, or tubs, or planted out. It forms a striking contrast to all other fruits, thrives well in the form of a standard or pyramid, and is a highly ornamental object while laden with ripe fruit. The improved climate of the orchard-house, as well as the compression of the roots within the narrow limits of pots, hastens and heightens their fertility.

Amateurs who keep silkworms will also find it most convenient to grow some trees in pots under glass, as not seldom the worms are hatched before the leaves are developed, and perish in consequence.

The Mulberry also bears forcing well. Plants introduced into a Vinery at work in January, and subjected to the same treatment, will be ripe in June; and there is something specially interesting and pleasing in having ripe Mulberries under glass, while the trees are barely broken into leafage in the open air.

CLIMBING PLANTS.

HARDY CLIMBERS AND CREEPERS.

IN the majority of English gardens not half enough is made of hardy climbers. Objectionable blank walls and old tree-trunks are, it is true, clothed with a mantle of Ivy or Virginian Creeper, but in how few establishments do we see anything like a natural arrangement, and the beautiful effects such as those produced by the Traveller's Joy (*Clematis Vitalba*) wreathing tall hedgerows, and sometimes trees of considerable size, on many a southern common!

Examples of what can be done by the judicious use of climbers may be seen by any one who visits the nurseries of Anthony Waterer and Son, at Woking. Here Wistarias have grown up Conifers, sixty feet or more in height, and the beautiful racemes are produced in great profusion, and make a picture that is not readily forgotten. Large-leaved Vines, too, with flowers delicately scented, stretch from tree to tree, and make festoons of surpassing loveliness.

To the Laburnum, again, a Wistaria gives an additional element of beauty, as both flower at about the same time. With old-established trees, which it is desired to clothe with climbers, some difficulty is often experienced in getting the latter to grow—the roots of the tree have impoverished the soil, and its head prevents a due share of light and moisture from reaching the thirsty climber at its base. In such cases it is better to place a strong plant in fresh soil at some distance from the trunk, and attach the shoots to it. As soon as the latter get upwards to the light, growth is rapid enough. The Virginian Creeper, treated in the manner just described, assumes somewhat the appearance it exhibits in its native woods, and the long pendulous shoots, in autumn clothed with bright crimson foliage, lend an indescribable charm, and somewhat of a tropical luxuriance, to the rigid branches of Oak and other trees. Many climbers are cultivated on walls, which would do equally well on trees if looked after for a few years until their slender branches had secured a position where they could obtain the light and air essential to their well-being.

Ivy soon covers old pollards and tree-trunks, and if the Chinese *Jasminum nudiflorum* be planted at the same time, it thrives apace, and its naked flowering shoots, laden with small Primrose-like yellow blossoms in winter or early spring, look infinitely more attractive when set off with the background of dark green afforded by either our wild Ivy or any of the stronger-growing larger-leaved cultivated varieties. For positions under trees, where the shade is so dense that few plants will grow, Ivy forms perhaps the best of all coverings; and shade-loving Ferns, deciduous or evergreen, are quite at home in its company.

In the following list no annuals or half-hardy plants are included, but only such hardy plants as, when established, are able to hold their own against natives of the soil. They will also be found of general use in most gardens for a variety of purposes.

Apios tuberosa, the Ground Nut, or Wild Bean, of the Northern United States, is a pretty climbing perennial, with pinnate leaves and brown-purple or chocolate, violet-scented flowers, borne in dense and short, often branching, racemes.

Aristolochia sipho, the Pipe Vine, or Dutchman's Pipe, of the Eastern United States, is, in its native habitats, generally found climbing trees in rich woods. As a rule, in this country it is restricted to covering walls and arbours; but it is equally fitted for the woodland walk and wild garden, where it should be attached to the trunks of trees, and looked after until its long stems have reached as far as the outer lower branches. After that no further care will be necessary. The large, round kidney-shaped, glabrous leaves are distinct in form from those of any other hardy climber.

A. tomentosa, also a native of the United States, has downy or softly-hairy, round heart-shaped leaves, and may be used under similar conditions to *A. sipho*. The former has brown-purplish flowers, and the latter dark purple ones; both, as far as flowers are concerned, being more curious than pretty.

Bryonia.—The best-known member of this genus is *B. dioica*, the Bryony of the British flora, an elegant climbing perennial, with a root-stock of very large, fleshy tubers. The graceful habit and pretty leaves and tendrils are attractive enough by themselves; but in autumn the plant is especially ornamental, by reason of its wreaths of bright red berries. In many parts of Britain this is somewhat rare; it is, however, easily procured, and if a good tuber be planted in a thicket or hedgerow, it is almost certain to grow freely.

B. alba is a Central European species, of similar habit. The so-called Black Bryony—*Tamus communis*—is also useful in similar places.

Celastrus.—In this genus are two very desirable species. The best-known is *C. scandens*, the Wax-work, or Climbing Bitter-sweet, of the Eastern United States. This grows along streams and in thickets, but it sometimes climbs to a considerable height up trees. It has oval-oblong, serrated, light green leaves, and raceme-like clusters of small

greenish flowers, terminating the branches. The great beauty of the plant, however, resides in the opening orange-coloured pods, which in autumn display the scarlet seeds.

C. Orixa, from Japan, is a plant of similar habit, but with longer, darker green, firmer leaves.

Clematis.—A selection of these will be found in the series of articles on TREES AND SHRUBS. The best and most effective in the wild garden are our native *C. Vitalba*, and the South European *C. Flammula* and *C. Viticella*.

Cocculus.—This genus, and *Menispermum*, are the only hardy representatives of the Moonseed family, both hailing from the United States. *Cocculus* does not, as might be inferred from its name, furnish the poisonous berries called "Cocculus Indicus," which are the produce of an allied genus belonging to the same natural order. The leaves are minutely pubescent, and vary in outline from ovate to cordate, and are entire or sinuately lobed; the fleshy fruits are as large as a small Pea, and are red when ripe. The inconspicuous greenish flowers are borne in axillary racemes or panicles, and open in July and August.

Convolvulus.—This genus, besides our native Bind-weed, *C. sepium*, is a great pest in rich garden ground, but a beautiful climber in the hedgerow or in certain spots of the wild garden, and furnishes several good plants. For instance, *C. Dahurica*, with its cordate leaves, and handsome deep rose-coloured flowers; *C. pubescens*, with its hastate downy leaves, and large flesh-coloured flowers; of the last-named species there is a very showy variety with very double flowers. *C. altheoides* has silvery lobed or dissected leaves, and delicate rose-coloured flowers borne in pairs—it is a South European perennial. *C. Scammonia*, which furnishes the scammony of the druggist, is also well worth a place in any sunny spot; its roots do not run or indeed increase to any great extent; it has hastate leaves, and long-stalked, white or pink-tinted, trumpet-shaped flowers.

Coronilla varia is a charming perennial, suitable for planting in company with Ivy amongst a heap of old roots, or by itself amongst low-growing shrubs. Its pretty pinnate Pea-green leaves, and the profusion of pinkish-lilac Pea-shaped flowers, render it one of the most attractive of hardy plants. It is a native of South Europe, and rarely attains a height of more than four feet. On the margins of woods in a few places in this country it has become naturalised.

Cotoneasters.—Few shrubs make more ornamental objects under suitable conditions than do some of the dwarfer-growing evergreen Cotoneasters. Their dark green leaves form a pretty contrast, both to the white flowers and the abundant crop of red fruit which succeed them. The best as semi-creepers are *C. microphylla* and its smaller-growing varieties, and *C. marginata* and *C. buxifolia*.

Eccremocarpus scaber belongs to an order (*Bignoniaceæ*) which furnishes but few plants that thrive in the open air in Britain. It is a handsome Chilian climber with much-divided leaves, and orange-coloured tubular flowers. Although it is much cultivated as an ornamental creeper, we have never seen it to greater advantage than in one spot, amongst tall shrubs, where it had become established entirely without assistance. Some of the sweepings-up of a large garden in a Northern county, containing seed-vessels of this plant, were thrown into the corner of a shrubbery, and in a season or two the hedgerow and the nearest shrubs were covered with the splendid flowers of the *Eccremocarpus*, the plants amongst which it had to struggle for existence affording the necessary protection against the inclemency of the winters, which often proved almost too much for individuals under apparently more favourable conditions.

Gualtheria Shallon.—Wherever the soil is of a peaty character, it is well to plant this pretty evergreen shrub from North-west America. It is neither a climber nor, strictly speaking, a creeper, but it throws up abundance of stems, and soon makes a thick undergrowth in dense Pine woods, and in spots where most other shrubs refuse to grow. In some places it is used somewhat extensively, both for the shelter which it affords to game and for the sake of its pretty fruits, of which pheasants are fond.

G. procumbens, the Aromatic Wintergreen, the Creeping Wintergreen, or the Partridge-berry, of the Eastern United States, is a charming little plant with Box-like leaves and slender stems, extensively creeping on or beneath the surface of peaty ground, in which it loves to grow. Both the bright red berries and the foliage have the well-known spicy aromatic flavour of the Sweet Birch of North America; indeed, it is from them that the oil of Wintergreen, an article largely used for perfumery purposes, is obtained. This plant grows well under the shade of tall-growing evergreens, and also on cool damp spots, amongst rockwork.

Hablitzia tamnoides, a perennial twiner, from the Caucasus, is a rapid grower, of elegant habit; it has a Turnip-shaped root, a furrowed stem, and alternate, long-stalked, smooth, heart-shaped, pointed leaves. The small greenish flowers are collected

into dense axillary panicles. This should be planted amongst tall deciduous shrubs, or amongst brushwood, in order for its pretty foliage to be seen to best advantage.

Hop (*Humulus Lupulus*).—Both the male and female plants of the common wild Hop make beautiful objects if allowed to roam at will among shrubs and small trees. The female plant, especially, is very attractive when laden with large cone-like catkins.

Ipomæa.—In dry, sunny spots, amongst low shrubs, &c., the Jalap Plant, *Ipomæa purga*, with its large purplish rose-coloured flowers, and smooth arrow-shaped or heart-shaped leaves, makes a very attractive object. In all probability it is not the cold of an English winter which proves fatal to this Mexican tuberous-rooted perennial, but the excessive wet. Care should, therefore, be taken to choose a well-drained, dry, sunny spot for it. We have seen it thriving beautifully among dwarf-growing Yews, Laurels, &c., where it never received any shelter beyond that afforded by the shrubs among which it grew. *I. pandurata*, the Wild Potato-vine, or Man of the Earth, of the United States, is a very different and much stronger-growing plant than the last-named. Like all the other members of its family, it delights in a warm, sunny spot. The leaves are mostly heart-shaped, pointed; occasionally some of them are contracted at the sides, so as to be fiddle-shaped (hence the specific name). The flower-stalks, which are larger than the leaf-stalks, bear from one to five large white purple-tubed flowers.

Lathyrus.—The cultivated Everlasting Pea (*Lathyrus sylvestris*, var. *platyphylla*) is one of the very best of hardy perennial climbers for a sunny spot. *L. rotundifolius*, a native of South Russia and Asia Minor, has brilliant rose-coloured scentless flowers, and is, perhaps, the most beautiful of the group. *L. tuberosus* is a dwarfer-growing species than those above-mentioned, and therefore it should be planted amongst low-growing shrubs in a sunny spot; it has crimson flowers, and by the side of a low hedge it forms a very beautiful sheet of colour. Care should be taken to plant this beautiful species where its tubers would not interfere with any other plants, as it is difficult to eradicate when thoroughly established. In some parts of the Continent this used to be, and is now, cultivated for the sake of its edible tubers.

Lonicera.—The beauty of the common widely distributed native Honeysuckle (*L. Periclymenum*) is too well known to require comment. It thrives apace if allowed an old trunk or the upper part of a Pine-tree, or some similar support, all to itself. The garden varieties will be found described under Trees and Shrubs. *L. sempervirens*, the Trumpet Honeysuckle, is, unfortunately, not to be trusted, except in favoured places in the South; it has scentless scarlet flowers, and is perhaps the most brilliantly coloured Honeysuckle in cultivation.

Lycium.—Amongst the *Lyciums*, or Box Thorns, there are three species which are hardy scrambling or hedge plants.

L. barbatum is a climbing, deciduous, spiny shrub, with flat, glabrous, acute lance-shaped leaves, and purple yellow-throated flowers, succeeded by egg-shaped yellow berries. Graceful in habit, and decidedly ornamental, both in flower and fruit, it seems somewhat strange that so pretty a plant should not be more frequently met with.

L. Chinense has handsome purple flowers, with a starry white centre, and orange-coloured fruits, ripening in early autumn. This plant was at one time believed to be that which furnished tea, and the best-known English name for this species, and others mentioned here, is still Tea-tree.

L. Europæum—another South European species—is a very rapid grower, with long slender shoots, laden with violet flowers, and bright scarlet or yellow fruit. It thrives in almost any soil or situation, and is almost unequalled for forming an elegant and effective summer covering for a rustic arbour, or for covering a rustic archway in the woodland walk. If trained up the trunk of a dead tree it will reach a considerable height, and its long shoots hang like a screen on all sides to the ground. The unripe fruits, that are lurid purple in colour, contrast markedly with the bright scarlet or yellow ripe ones.

Menispermum Canadense, the Moonseed of Canada and the North-eastern United States, is a tall climber, with three to seven-angled or lobed, light green, deciduous leaves. In sunny spots it flowers in June and July, and ripens its rather large bunches of black bloom-covered fruits, somewhat resembling small Grapes, in September.

Muhlenbeckia.—Some of the Australian members of this curious genus of *Polygonaceæ* are elegant climbers, distinct in habit and general aspect from any others. *M. complexa* is a fast-growing evergreen with slender wiry stems, and tiny roundish leaves; it is quite at home amongst shrubs, &c., and will soon climb to a considerable height.

Roses.—The varieties best suited for arbours, trees, or walls have already been mentioned in the special articles upon this flower.

Rubus.—Of the hundred or more species of *Rubus*, nearly all of which hail from various countries of the Northern Hemisphere, many are rambling or half-climbing plants. The picturesque beauty of the Brambles of our commons and hedgerows is too well known to need commendation here. One of the forms of our native *R. fruticosus* is, however, of so marked a character that it deserves special mention. *R. laciniatus* (for this is the botanical name of the form in question) does not differ materially from the common Bramble, except in the elegantly-cut leaflets, which have earned for it in some books the name of Parsley-leaved Bramble. It has large sweet fruits, for which, in some places, it is even accorded a place in the fruit garden.

R. biflorus, often called *R. leucodermis*, is a Himalayan species, remarkable for the thick white bloom which clothes the stems and branches. In a leafless state this is so conspicuous as to lead those unacquainted with the species to believe that the stems have been whitewashed.

R. discolor.—One of the most widely distributed of the British forms of *R. fruticosus;* there is a double-flowered variety, which passes in nurseries under the name of *R. bellidiflorus*. It is a beautiful, very floriferous plant, with pinkish flowers, about as large and as double as some of the Pompon Chrysanthemums. Another Bramble of vigorous habit and with large white flowers is *R. tomentosus flore-pleno*, a double form of a Continental species, which does not occur in a wild state in Britain. Both this and the last-named are charming and highly ornamental plants. (See also Trees and Shrubs.)

Smilax.—The genus *Smilax* contains nearly two hundred species, and is widely distributed in tropical and temperate regions. The roots and root-stocks of some of the *Smilax* constitute the sarsaparilla of the shops.

S. aspera—a native of the South of Europe—is perhaps one of the handsomest members of the group; it is a climbing evergreen, with leathery, dark green, prickly, cordate leaves, not unfrequently having a beautiful dark brownish mottling. This certainly flowers most freely against a wall, or in some warm sunny spot; but it does well when allowed to creep over rough trellis-work.

S. rotundifolia, the Common Greenbriar of the Eastern United States, is in most places in Britain a deciduous climber, though in its native localities it inclines to be evergreen. This species will hold its own against most shrubby plants; amongst rough heaps of tree-stumps it flourishes well, and forms a very agreeable and pretty summer covering.

Solanum.—Few of the species of this large genus come under the definition of hardy climbers. One, however, our native Bitter-sweet, *S. dulcamara*, is conspicuous and beautiful enough, either in flower or fruit, to thoroughly merit a place in any list of garden plants. It is a trailing perennial, with long flexuous stems, and large clusters of small Potato-like flowers with golden-yellow anthers, succeeded by bright scarlet berries. *S. crispum*, a handsome Chilian species, has lavender-coloured flowers, very much larger than those of the Bitter-sweet.

Thladiantha dubia is a highly ornamental perennial Cucurbit, with tuberous root-stock; it is a tall climber, with pale green, ovate-cordate, irregularly toothed leaves, and bright yellow axillary flowers, the two sexes being produced by different individuals. Given a sunny spot, there is little fear of this dying if planted in anything but the most barren soil. It is a native of both China and India. The male plant is the most common in this country.

Vicia.—The Wood Vetch, *V. sylvatica*, of the rocky woods of the northern parts of the British Islands, is one of the most elegant of our native plants. It has long, one-sided racemes of large showy flowers, white, marked with blue veins. It grows well amongst rocks or stones in a damp, half-shaded spot, but will thrive in any moist open spot or garden border.

Virginian Creeper.—See *Ampelopsis*, under Trees and Shrubs, also Window Gardening.

Wistaria.—See Trees and Shrubs.

HALF-HARDY CLIMBERS.

By R. A. Rolfe, A.L.S.

Valuable as are the numerous and beautiful hardy climbers, there is still an equally beautiful group of plants, which, though not strictly or wholly hardy, contributes largely to the adornment of our gardens. There is no sharp line of division between "half-hardy" and "hardy" climbers. Some of the latter have an unfortunate habit of getting killed to the ground when an exceptionally severe winter comes round, while not a few of the former live through mild and ordinary winters uninjured. And again, many plants may be considered hardy in the South and West of England, which need protection in winter in the North. All of them, however, may be said to require the protection of a mat in severe weather, or in the more inclement parts of our islands. The judgment of the cultivator must therefore be exercised in making a selection for any given district.

Respecting their cultivation, the soil should be well drained, as anything like stagnant water in the

soil is very injurious. The annual species require a rich soil, being generally rapid growers and gross feeders. The situation should be a sunny one, and sheltered from wind as much as possible. Copious waterings should be given in dry weather. Some light Pea-sticks or open trellis-work should be provided for them to climb upon. The perennial species are well adapted for permanently covering walls or similar situations, more especially the evergreen kinds. During severe weather mats should be nailed over them, or any other covering which may be at hand; a little attention in this respect for a short time often preventing them from being permanently injured or killed outright.

The following list is not by any means an exhaustive one, but affords a selection of the more showy and useful species.

Akebia quinata.—An elegant twining plant, with palmately divided leaves of three or five stalked leaflets. The flowers are deep purple, and borne in short axillary racemes in the spring. It is hardy in the milder parts of England. It is a native of China and Japan, and was introduced by Fortune in 1845 from Chusan. It is delightfully fragrant. It is readily propagated by cuttings from the stem or roots, and succeeds best when planted against a sunny wall.

Berberidopsis corallina.—A very ornamental climbing shrub, with oblong spiny leaves, somewhat resembling those of a *Berberis*. The flowers are of a rich crimson colour, and borne in drooping racemes at the ends of the branches. It is certainly one of the most effective wall plants when in flower, and quite hardy in some places, while in others protection must be given.

Clianthus puniceus.—A large, very showy perennial climber, known in its native country of New Zealand as the Parrot's-bill, in allusion to the shape of the flowers before expanding. It has pinnate leaves, with numerous small leaflets, and drooping racemes of bright crimson flowers, which, when expanded, measure three inches from the tip of the keel to that of the standard, which is sharply bent back. It grows to a large size against a sunny wall, its handsome flowers being produced in profusion. During severe weather it needs some protection, though in some localities it is quite hardy. Its name indicates "Flower of Glory," and is extremely appropriate.

Cobæa scandens.—Sow in a gentle hot-bed in the spring, and plant out at the end of May or beginning of June. It is of rapid growth, and soon attains a considerable size. The variety *albo-marginata*, with variegated foliage, is very handsome, and requires similar treatment. It must, however, be propagated by cuttings, as it does not come variegated from seeds.

Cucumis myriocarpus. — The Thousand-fruited or Gooseberry Gourd, sometimes called *C. grossularioides*. It bears small green fruit, somewhat resembling a Gooseberry, hence the name. It requires similar treatment to the next (*Cucurbita Pepo*).

Cucurbita Pepo.— The ornamental Gourds are exceedingly handsome decorative plants when covered with fruit in the autumn. A rich soil and warm situation are necessary. They should be sown in heat, so as to get good plants to place outside at the end of May. There are numerous ornamental varieties, which are variously marked with yellow and green, and some of them covered with warts. The fruits are useful for room decoration when frost has killed the plants.

Grammato carpus volubilis. — A pretty, slender, climbing annual, belonging to the same family as the *Loasa*, and requiring similar treatment. The leaves are pinnatifid, with three to five lobes; the flowers an inch in diameter, and deep yellow in colour. The seeds should be sown in light rich soil, in a sunny position, where it grows to a good size, and flowers for a considerable period, making a very pretty object.

Holbœllia latifolia (*Stauntonia latifolia*).—A large evergreen climber, with ternate or palmately divided leaves of a bright green tint. The flowers are pale green, and borne in axillary clusters. It flowers in the spring, and the male flowers are said to be produced a little later than the females, and to diffuse a delicious perfume in the evening. It is best suited for the warmer parts of the country, and should be protected with mats during severe weather.

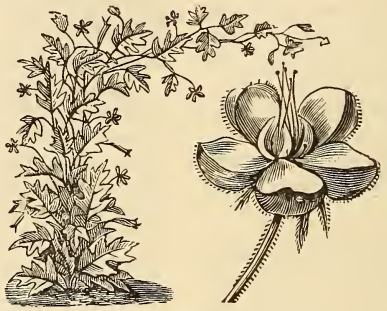
Ipomœa purpurea.—The Convolvulus major of gardens, also known as *Pharbitis hispida*, and too familiar to require description. The flowers open in the morning, and present a combination of carmine and violet or purple, some varieties being pure white and others of a rosy tint. The slender stems twine round and round their supports, hence slender poles or similar upright supports are the most suitable. The seeds should be sown in April, in good soil. Flowers are produced all the summer.

Lapageria rosea.—A superb green-house climber, already described (see GREEN-HOUSE PLANTS) but which grows and blooms exceedingly well out of

doors in the South-west of England. It likes a deep and moist but well-drained soil.

Lardizabala biternata.—A tall, rapid-growing climber, with glossy, dark green, twice or sometimes thrice ternate leaves. The flowers are borne in drooping racemes in the axils of the leaves, and are of a peculiar purplish-red colour. It should be shaded from intense sunshine, and though hardy enough to stand ordinary winters in the milder parts of the kingdom, it should be protected in severe weather. The fruit is edible, and is sold in the Chilian markets.

Lathyrus odoratus.—The annual Sweet Pea may now be had in many distinct colours, and is as easily grown as the ordinary edible garden Pea. The ground should be well manured, and the seeds sown early and not too thickly, for when too thick they starve each other. They should be liberally watered in dry weather, and if a long succession of bloom is desired, all the old flowers should be removed as soon as they fade, thus preventing the plants from exhausting themselves by seeding.



Loasa Lateritia.

Loasa lateritia. — A handsome annual climber, with slender hispid stems and pinnate leaves, with deeply notched divisions. The leaves are, like the stems, covered with stinging hairs, like the Nettle. The flowers are large, orange-red in colour, and each borne on a distinct peduncle. It is a native of Uruguay, and hence likes a warm sunny situation. In good soil it will grow several feet high, flowering profusely until cut down by frost. It may be sown in heat and planted out when all danger of frost is over, or sown in the open ground during May.

Maurandia Barclayana.

Maurandia Barclayana.—A slender-stemmed and very handsome herbaceous climber, attaching itself to its support by twisting the leaf-stalk round it. It grows several feet high in a sunny sheltered situation, producing triangular cordate leaves, and large deep purple flowers. It continues to bloom for a considerable period during the summer and autumn. It is only suitable for out-door cultivation in the summer, and young plants should be obtained by means of cuttings.

M. erubescens.—Another very handsome climber, requiring similar treatment to the preceding, both of them being natives of Mexico. It has heart-shaped, toothed, hairy leaves, and showy rosy-purple flowers. It grows several feet high, and when well bloomed is a very effective plant. It is also known as *Lophospermum erubescens* and *L. scandens;* the latter, however, being incorrect, as the true *L. scandens* is quite a distinct plant.

Mutisia decurrens.—A very handsome scandent climber, belonging to the Composite family, with large flower-heads, measuring four and a half inches in diameter, and of a brilliant orange-colour. The leaves are lance-shaped, and the midrib is prolonged into a tendril, by means of which it climbs. It should be planted against a sunny wall in a good loam, and well protected in winter. Unfortunately, it does not succeed well everywhere.

Passiflora cœrulea.—The common Blue Passion-flower is one of the most beautiful half-hardy climbers in the South of England, and is especially suited for high walls or the fronts of houses: indeed, in the latter position it is very commonly met with in many of the London suburbs. It should be planted in a good border. In fine summers an abundance of orange-coloured egg-shaped fruit is produced, which hang in festoons till the winter, producing a most charming effect. In the winter the branches should be well pruned back.

Sollya heterophylla.—This elegant green-

house climber is well adapted for outside cultivation in summer, and should be placed in a sunny sheltered position, when its bright deep blue flowers are produced in profusion for a considerable time. It is readily propagated by cuttings.

Tecoma radicans. — The Trumpet Flower, sometimes known as *Bignonia radicans*. A tall, handsome climber, with bright green pinnate leaves, and very showy orange and scarlet flowers, which are produced in the summer months. Rootlets are produced from the joints of the stem, by which it supports itself. It succeeds well against a warm wall or sunny bank. It may be propagated by cuttings.

Thunbergia alata.— A handsome annual, which succeeds well in a sunny situation during the summer months. The slender twining stems should be provided with a few light sticks to climb upon. A light rich soil is the most suitable.

Thunbergia Alata

Tropæolum. — Three species of this highly ornamental genus, with their many varieties, deserve mention here.

T. aduncum.—The Canary Creeper, sometimes known as *T. peregrinum*, from its rambling habit, and *T. Canariense*, an crroneous and misleading name. It is a charming plant, and suitable for covering walls, palings, balconies, rustic arches, and many other similar situations. The leaves are small, with five rounded lobes, and the bright yellow flowers are beautifully fringed. The seeds should be sown in March or April, in good soil, and very shady positions should be avoided. It is a native of New Grenada.

T. majus.—This plant often goes under the name of Nasturtium, and it is one of the best of all plants for the summer coverings of old palings or similar objects. It likes a good soil and a sunny position, and with these requisites little is required beyond planting the seeds in March or April, and providing the necessary supports. A few twiggy branches of trees may be placed for the plant to climb upon, or keep it close to a wooden fence or wall. The plant is grown by some as a kitchen garden herb, the young flower-buds and green fruits being pickled in vinegar, and used instead of Capers, to which some people consider them preferable.

T. speciosum.—A charming and neat little climber, with small four to six-lobed leaves, and a profusion of crimson-red flowers of peculiar shape, succeeded in the autumn by a crop of striking blue berries, making a brilliant contrast with the bright green foliage. It is seldom, however, seen doing well in the South of England, while in Scotland it may be seen climbing up the gable-ends of buildings in the most luxuriant health. It has a running underground perennial stem, by means of which it spreads, and from which young plants may be obtained. A north wall should be selected, or a position where the sun only shines for a short time in the morning or evening, and good drainage secured, as the plant is very impatient of stagnant water at the roots; a little leaf-mould and sand should also be forked in. During warm weather occasional syringings should be given, and copious waterings when necessary; a mulching of light rotten manure should also be given. By these means the roots are kept cool and moist, and red spider kept in check: an insect to which the plant is especially liable.

The most desirable *Tender* climbers and creepers will be found treated of under the head of Green-house or Stove Plants.

In addition to the foregoing and the many climbers enumerated as adapted for window gardening, the following plants are often used for the clothing of walls, covering of arbours, &c.:—

Berberis Darwinii.
Bignonia capriolata.
Bignonia grandiflora.
Bignonia radicans major.
Bignonia sanguinea.
Buddleia globosa.
Ceanothus azureus, and others.
Cotoneaster Simondsii, and others.
Escallonia macrantha, and others.
Ligustrum Japonicum—Japan Privet.
Magnolia grandiflora, and others.
Pyracantha Lelandii, &c.
Pyrus Japonica—alba rosea—sanguinea.
Wigelia of sorts.

There is also a golden variegated-leaved variety of the common white *Jasminum officinalis*, which is more dwarf and equally fragrant as the plain-leaved and universally-grown one.

SELAGINELLAS.

By W. Watson.

ALTHOUGH popularly known as Lycopodiums and generally considered to belong to the Fern order, the genus *Selaginella* is quite distinct both from true Lycopodiums and from Ferns. It comprises about 300 distinct species, according to the latest synopsis. The characters by which the genus is distinguished from the Lycopodiums are the distichous arrangement of the scale-like leaves along the stems, which gives them the familiar flattened appearance, and the fruit in small, often four-angled, clustered spikes on the ends of the branches. The spores are never employed as a means of multiplying these plants, as every one of the kinds which have been in cultivation is easily propagated from cuttings; and in fact the spores of all the genera belonging to the Lycopod order so very rarely vegetate that it is questionable if, under artificial conditions, the plants are capable of producing fertile spores.

Cuttings taken from the lateral branches of the stronger-growing kinds, and from any part of the tufted species, will readily root if inserted in the spring or early summer, using for them a sandy peaty soil, and placing them in a close propagating box or under bell-glasses till rooted. Except only the several species found in the higher alpine regions, all the Selaginellas thrive best when shaded from bright sunshine, though during winter it is necessary that they should obtain all the light possible, as it is owing to the want of light at this season that the leaves turn brown and often damp, giving the plants a very untidy appearance. In tropical regions these plants are abundantly represented wherever shade and moisture exist. They all delight in a spongy soil, and in cultivation they require during summer an abundance of moisture, both at the roots and in the atmosphere surrounding them. In winter less moisture is necessary, because of the unfavourable conditions as regards light and temperature, otherwise it would not matter, as under natural conditions anything like a rest for these plants means simply more or less injury.

Many of the species may be effectively used to cover the sides of baskets in which Ferns are growing, for clothing the bare stems of the Ferns, or planting upon the soil in very large pots, or, in summer, to cover bare spaces either under or upon stages in green-houses or stoves. At Kew some pretty combinations of Ferns and Selaginellas are grown in baskets suspended from the roof of the Tropical Fernery; a list of the kinds thus used is given on the next page. Several species, and especially *S. Kraussiana* (known in gardens as *S. denticulata*), are largely grown by market-gardeners and florists for house and window decoration, and in London thousands of potfuls of these "Fern-mosses" are sold annually by the florist to the poorest as well as to the richest of window-gardeners. The fresh clean green foliage of the kinds thus used may be enjoyed for at least several months, if a bell-glass is placed over them and they are kept continually moist.

Perhaps the most noteworthy of the climbing Selaginellas is *S. canaliculata*, which is the strongest and stoutest among the cultivated kinds, and which is represented at Kew by a plant about six feet high, with a stem nearly an inch through, dark brown, covered with scattered scale-like leaves, and bearing long branches distichously arranged, upon which the pale green leaves are developed in the usual flattened way. *S. Wildenovii*, the Blue Lycopod, is interesting because of its quick-growing scandent habit, some of the shoots having at Kew grown to a length of twenty-five feet in one year, and its bluish-tinted foliage, which with the light falling upon it at certain angles reminds one of well-tempered steel. These and other climbing species may be made to form handsome specimens by training them upon balloon trellises, or they may be used to cover walls or pillars, or even grown as basket plants, if the long shoots are made first to cover the soil and basket, and then allowed to hang down and grow as they please. These species are of great value for purposes of this kind, as they thrive in positions where many other plants would damp off; and they also form, in conjunction with the Lygodiums, the only plants available for draping pillars in Ferneries, that is, assuming the desire of the cultivator to be to limit the plants in his Ferneries to true Ferns or their allies.

The majority of the species are wild in tropical countries only, others coming from temperate climes, whilst one or two may be considered as being natives of cold countries. Bearing these facts in mind, it is easy for us to separate the cultivated kinds into tropical, sub-tropical, and temperate groups. Of course Selaginellas are grown in temperatures slightly different from those given in the following lists, but so far as our experience goes, they do not thrive long unless grown in something like the degree of heat here advised for them. All the species grow vigorously in the latter part of our summer, so that in the autumn we usually find them looking their best. Propagation should be managed as early in the spring as is convenient, and as the growth of the plants from which the cuttings are to be taken will admit of.

Varieties.—In making a selection of the species to be mentioned here, we may take as a guide the collection of Selaginellas in cultivation at Kew, where no less than sixty distinct species and varieties may be seen, and by bringing into prominence those kinds which there prove to be very ornamental and of the easiest possible cultivation, we may perhaps do something towards popularising a remarkably beautiful and varied group of elegant foliage plants.

Tropical Species.

For these a summer temperature of 70° to 75°, and in winter 60° to 65° are required, though in a dry house with a light aspect the latter temperature is 5° higher than would be really necessary.

S. atroviridis—this grows to about one foot in height, with rather stout stems, which are clothed with broad, overlapping scale-leaves of firm texture, and olive-green in colour. It is one of the most distinct of the sub-erect, broad-leaved group, of which S. Martensii is the best-known example. A native of the Malay Peninsula.

S. canaliculata has a cylindrical stem about half an inch in diameter, smooth, shining, reddish-brown in colour, the surface thinly covered with the green scale-leaves. The main branches are developed in a distichous manner, and are semi-erect, and from these lateral branches are produced. The length of one of these main branches upon a plant at Kew measured three feet. East Indies. Introduced recently under several names—viz., S. conferta, S. muricata, and S. caudata, and probably S. cognata.

S. caulescens—stem erect, about a foot high, branched upon the upper portion, with frond-like pinnate leaves, which are pale green, and thin in texture. The variety Japonica has less crowded pinnæ, which are not so deeply cut as in the type; the variety argentea has long pale green pinnæ, which are silvery on the under side.

S. convoluta—very similar to the Resurrection plant, or Hygrometric Club-moss, botanically known as S. lepidophylla. The foliage of S. convoluta is dark bluish-green in colour, and is remarkable for its producing adventitious buds as in the Aspleniums, but in the Selaginella the proliferous portions are merely fragments of the leaves, which form roots before falling to the ground, where they soon establish themselves. The fronds have a curiously wrinkled, or crimped, appearance, and are somewhat firm in texture. Tropical America.

S. cuspidata — generally known as Lycopodium cordifolium. It has tufted stems a foot in length, freely branched, and is noted for the beautiful green and elegantly divided character of its white-edged foliage. It is one of the Rosulate group, and when well-grown forms a specimen not unlike Todœa superna. The variety elongata is even more elegant than the type, having long, arching, graceful fronds, which sometimes attain to two feet in length. Tropical America.

S. erythropus—a handsome species with erect, bright crimson stems, eight or ten inches long, and clothed with recurved branches, upon which the tiny scale-leaves are close-packed, having a very nice effect. In well-grown specimens the fronds are freely branched, and when in fruit the fringe of tiny spikes which surround the margins of every division of the frond is very ornamental. This is sometimes called S. setosa and S. umbrosa. Tropical America.

S. flabellata—closely allied to the last-mentioned species, but differs from it and the rest of the Caulescent group in having its fronds recurved much more distinctly. Stems about two feet in height, erect, branched above, with pale green foliage closely packed along the upper portion of the branches. Tropics of both worlds.

S. flexuosa — a plumose species, with erect stems a foot long, freely branched at the base, the under sides of the fronds freely rooted. It has been called Lycopodium stoloniferum. South Brazil; recently introduced to cultivation.

S. Galeotii—a long-fronded, graceful species, with stems about a foot long, from which the branches or fronds often grow to a length of three feet. Trailing rather than climbing. The smaller branchlets are thickly covered with small overlapping scale-leaves. Mexico.

S. grandis—this is the handsomest of the larger-growing kinds, and one of the most beautiful of foliage plants. It has broad, flattened, bright shining green fronds, the upper portion curving over so as to present a curiously rounded surface, which shines like the scales on a salmon's back; they measure quite a foot across. When mature the fronds produce a close fringe of graceful, tassel-like fruit-spikes, which hang downwards, and add to the beauty of the plant. Syn., S. platyphylla. Borneo.

S. hæmatodes—one of the finest of all cultivated Selaginellas. Stem erect, bright crimson, unbranched below, and bearing upon its apex a large deltoid frond, the divisions closely overlapping each other; upper surface a bright shining green, the under side being much lighter and glossy. When well grown the fronds are frequently twelve inches across. At Kew the enormous specimens of this Selaginella form one of the principal attractions in the Tropical Fernery. Tropical South America.

S. inæqualifolia—closely related to S. canaliculata. The stems are semi-erect, sometimes four feet in height, and bear oblong lance-shaped pinnæ, six inches long, which are much divided and are a rich deep green colour. It grows very quickly, and in a tropical moist house soon forms a handsome specimen. Var. bellula is dwarfer in habit and has shorter pinnæ. East Indies.

S lævigata is distinguished by its pale green colour and rigid, falcate, pointed, almost spine-tipped leaves. It produces a frond about two feet in length, which spreads out almost horizontally, and, owing to its firm, almost woody nature, retains this position from base to point. It is sometimes called S. pectinata, and a variety of it is in cultivation under the name of S. Lyalli. Madagascar.

S. Lobbii—this has erect slender stems three to four feet in height, and clothed with numerous alternate branches, which are feather-like, and are arranged at right angles with the stem. The colour of the foliage is a bright green. The fronds sometimes turn to a curious metallic green when old. A rare plant in cultivation, but represented at Kew by several large specimens. Borneo and Sumatra.

S. patula—one of the Martensii group, with decumbent stems, nine inches to a foot in length, branched, the branches narrow and short except the terminal one, which is lengthened out to a long whip-like tip. Jamaica.

S. plumosa—a dwarf species, with branches about half an inch wide and distinctly flattened out, or rather the distichous arrangement of the leaves produces that appearance. The stems are pale green in colour and do not generally extend to more than a foot in length. It forms a pretty tuft of dense dark green feathery foliage if planted in shallow pans and kept rather moist. There are several varieties of it in cultivation. East Indies.

S. serpens—a pretty little Moss-like species, the stems growing closely to the ground. By means of these roots this species is enabled to cling to any moist surface, such as walls, stones, on rockeries, or even to wood. The upper surface of the foliage becomes almost white towards the evening of a summer's day, resuming its normal green colour again during the night. This phenomenon is supposed to be the result of changes caused in the colour of the chlorophyll by the action of light. Syns., S. variabilis, S. varians, S. mutabilis, and S. Jamaicensis. West Indies.

S. Victoriæ—very similar to S. Wallichii. The stems are from three to four feet in height, semi-erect, forming along with the alternate branches a broad, flattened frond. The stems spring from a central tuft as in a Todœa, the fronds measure a foot or even more in width, and are bright shining green in colour. A very

warm moist corner should be found for this species, which is not one of the freest growers; in an ordinary stove it seldom thrives satisfactorily. Borneo and Fiji.

S. viridangula—another of the arborescent species, with stems four feet in length, semi-erect, and long lance-shaped pinnæ a foot or more in length, by which it may be easily distinguished from S. canaliculata, to which species it is otherwise similar. Fiji.

S. viticulosa—a caulescent species not very distinct from S. erythropus. Tropical South America.

S. Wallichii — the best known among the arborescent kinds and one of the handsomest and easiest to grow. It has erect, rather stout stems, about three feet long; lance-shaped pinnæ about nine inches in length, these pinnæ or branches being arranged alternately upon the stem; they are of a very dark green colour when the plant is in good health, and when covered with their freely produced fringes of fruit-spikes they are most attractive. East Indies.

S. Wildenovii—in addition to the extraordinary length of frond in this species, there is also the remarkable iridescent lustre of its foliage, which never fails to excite admiration. It branches freely, so that by pinching out the tips of the stems it may be induced to grow into a compact shrubby specimen. A Selaginella which produces stems twenty-five feet or more long, branches freely, and bears large, graceful, beautifully-cut fronds of a singular metallic lustre, ought not to be overlooked when forming even the smallest collection of stove plants. East Indies.

Selaginella Grandis.

Sub-Tropical Species.

For these a temperature of 60°—70° in summer, and one of 50°—55° in winter, will afford sufficient warmth. They may be grown along with such plants as Cattleyas or Begonias, which usually are treated as "intermediate" plants.

S. albo-nitens—a dwarf compact-growing Moss-like plant, belonging to the group of quick-growing

fugacious species, which spring up after the rainy seasons in tropical countries, and are mostly of only annual duration. Colour a bright green. Tropical America and West Indies.

S. Braunii—one of the few Umbrose kinds that thrive in a sub-tropical temperature. It is remarkable for the greyish hue of its foliage and is often known as S. pubescens. The stems are erect, about one and a half feet long, freely branched on the upper portion. It forms a handsome specimen when grown in a large pan. China.

S. brevicaulis forms a dense tuft of very short freely branched stems, which interlace and look like a patch of Moss. It is a useful species for clothing bare soil or growing as a carpet on a stage. Cuba.

S. delicatissima is another of the dense, tufted species, and may be grown in summer in an ordinary green-house, but owing to the curling effect a dry atmosphere has upon its tips, it should be placed in a sheltered, moist corner, where it will grow rapidly and form a bright green carpet over the surface of the soil. Country not known.

S. distorta—a dwarf, dense, Mossy-looking plant, its slender trailing stems matting together and forming a beautiful carpet of bright green. Brazil.

S. Douglasii—a small trailing species, with the habit and appearance of S. serpens, but paler green in colour. A native of the warmer parts of North America, and said to be plentiful about Washington, which seems to suggest cool treatment for this species; it does not, however, grow as satisfactorily in a cool as in a warm house.

S. Griffithii—a member of the Umbrose group, which have erect stalk-like stems, bearing upon their summit a spreading, more or less triangular frond. Syns., S. brevipes and S. virescens. Mountains of Mergui.

S. lepidophylla is the "Resurrection Club-moss" which is frequently exposed for sale as a vegetable wonder, owing to the manner in which its curled-up fronds unroll and resume a fresh appearance when placed in water. Generally the plants offered for sale in England are dried up past recovery, but the effect of water upon their dried leaves is the same as when they have life in them. When kept in a moist atmosphere the plants spread their flat green fronds over the surface of the soil, and form very pretty little star-shaped masses of a pale green colour.

S. Martensii is one of the best known and most accommodating "Mosses," as it seems to thrive almost equally well in a stove or in a cool house. There are numerous varieties of it in cultivation, one or two of them being variegated forms; the most distinct are divaricata, formosa, ascendens, stolonifera, and the variegated robusta. Mexico.

S. rubella is not unlike one of the forms of S. Martensii, but is at once distinguished by its reddish stems and dull green leaves. The stems are a foot long, semi-erect, copiously rooted, and bearing bronzy-green leaves, which become almost red when old, if grown in a light position. Native country unknown.

S. uncinata—this is the proper name for the blue-tinted species known in gardens as S. cæsium. It belongs to the trailing Plumose group, and has slender yellowish stems and bright blue-green foliage. It may be grown either in pans, or suspended in baskets from the roof; in the latter position it has a charming appearance, owing to the curious effect produced by the light when falling obliquely upon the bluish, shell-like leaves. China.

Cool-house Species.

These may be grown anywhere where frost is excluded, and where moisture and a little shade from the summer sunshine can be afforded them. In the warmer parts of England some of these cool species are grown out of doors during summer, and one of them—viz., the common *Kraussiana* (*denticulata*)—is often used for carpet-bedding.

S. apus, better known as S. densa, or S. apoda, is a most useful little decorative plant, and is largely grown about London, its turf-like, bright, healthy green being useful in numerous ways for table and window decoration. Probably an annual. Canada and the United States.

S. denticulata—this is very different from what is known in gardens by this name. It is a robust little trailer, running about and clinging to stones, or pots, in the most persistent way. It must be grown in a moist shaded place, or it will not thrive. In the autumn the leaves assume a reddish tint. Southern Europe and region of the Mediterranean.

S. Helvetica—a small trailer, very similar to S. denticulata, but not quite as pretty a green, and requiring a warmer position than suits that species. Central Europe to Japan.

S. Kraussiana, popularly known as Lycopodium denticulatum, grows in almost any position, asking only for a little water to keep its roots moist. The variety aurea is distinct and pretty, as also is the white-tipped form, and the small variety known as S. Brownii. Cape, and other temperate parts of the African continent.

S. Ludoviciana — a small, tufted, carpeting species, with the branches very closely arranged, and forming thick tufts of dark green; it is closely allied to S. apus. Alabama and Louisiana.

S. pilifera is very similar to S. lepidophylla, described under the Sub-tropical Species, differing only in the scale-leaves being bristle-pointed, those of the latter being obtuse at the points. Mexico.

S. rupestris is interesting chiefly for its being distributed over the north and south temperate zones of both the Old and New Worlds. It forms a tuft of rather long straggling stems, covered with pale green scale-leaves.

The following species are useful for furnishing baskets—viz., *S. cuspidata*, *Galeotii*, *flexuosa*, *uncinata*, *rubricaulis*, *radicata*, *rubella*. For carpeting bare spaces in conservatories, or upon stages, or wherever a Moss-like growth is wanted, the following are specially adapted—viz., *S. albonitens*, *apus*, *brevicaulis*, *delicatissima*, *distorta*, *Kraussiana*, *patula*, *serpens*, *uncinata*.

LYCOPODIUMS.

By G. S. Jenman, F.L.S.

LYCOPODIUM is a genus of more or less herbaceous perennial plants, most closely allied to *Selaginella*, with which it is generally associated, these and two or three smaller genera forming the natural order *Lycopodiaceæ*. Lycopodiums, as distinguished from Selaginellas, are the true Club-mosses—a popular term derived from the form of the fertile branches in some of the species. Great interest attaches to these plants as being the representatives, in the present flora of the world, puny though they be compared to their giant ancestors, of the vegetation which chiefly formed the coal deposits, to which is so largely due the wealth of England, and much of the prosperity and advanced civilisation of the world.

The distribution of the genus extends from the north temperate to the south temperate zone, but it is aggregated chiefly in the equatorial belt, both

species and individuals diminishing greatly in numbers as this region is receded from.

The terrestrial species grow on banks, or lightly-shaded ground, as a rule, rarely in deep forest. The ground may be either damp or well drained, and be as variable in the character of its composition, and some are found in humus and wet beds of sphagnum. The same species is often found under very different conditions in different countries. In the West Indies, I have gathered *L. dichotomum* in fully-saturated beds of Moss, and in Guiana on the branches of trees, where it was quite dry, and equally luxuriant under both conditions. It would not be well, however, to assume from this instance of apparent accommodation to diverse circumstances, that any mode of cultivation adopted would be successful; for, though the plants from the two countries were identical specifically, long ages have probably produced their adaptation to the difference in the conditions of the habitats noticed. Some species are indifferently terrestrial or epiphytal, but where this occurs they grow always either in peaty soil or leaf-mould. *L. taxifolium*, a strong-growing, well-known American species, is an instance of this fact, occupying branches of trees, or, on the other hand, logs lying on the ground. The epiphytal species grow in vegetable *débris*, or peat formed of root-fibres of other plants, such as Bromeliads and epiphytal Ferns, some of which produce this material plentifully (an excellent substitute for peat) on the branches of trees. Again, in forests, at high elevations, atmospheric moisture is so abundant that little root-hold is required to keep these plants, and many others, in good condition, though at a lower altitude the same amount might fail entirely to sustain them.

Except only with a few hardy temperate species, the garden cultivation of Lycopodiums has been almost a complete failure. This failure is very marked compared with the great success that has attended the growth in our gardens of their allies, the Selaginellas; the reason, however, for this difference is obvious. The Selaginellas will grow under any conditions which afford sufficient moisture. They expand rapidly, and a plant may be broken up into as many pieces as there are branches on it, and each piece inserted in the ground will, in its turn, become a rapidly-spreading plant, in hardly more time than a few days.

With the majority of Lycopodiums, however, almost the reverse obtains. They are impatient of much root-disturbance, and unless lifted from their habitats in very large unbroken sods of soil, do not live long when brought home. When well established they may be multiplied by division, which should be done carefully, so as not to disturb the firmly imbedded roots. The dichotomously forked species — whether terrestrial or epiphytal—may be either layered, struck from cuttings, or divided where pieces can be conveniently removed with good roots to them. This section is not so impatient of root-disturbance as the creeping species. For layering, any healthy shoots will do, treated in the usual way. Shoots not in fruit are the best; old, much-fruited shoots are useless. The same applies to cuttings; if possible to obtain, they should be young, vigorous, as yet unfruited shoots. Unfruited, I say advisedly, for in this section all the shoots become fertile in the course of time. In cultivation, under the process of reproduction, plants often become exhausted after a short time; it is better therefore, before this occurs, to cut the growths back, when they will break into bud again from the base.

All the pendent species should be grown in suspended baskets, in a mixture of chopped fibrous peat, sphagnum, a little clean silver sand, and some bits of charcoal. The drainage should be perfect. An idea of the kind of compost required for any terrestrial species might be formed from that of the natural material, some of which, in most cases, would be found adhering to the roots when the plant is brought home. Many, however, will do well in a mixture of peat and sphagnum, potted firmly. The drainage in all cases must be good, even for those that are sub-aquatic. The epiphytes are, of course, forest subjects, and require in cultivation moderate shade. Those that come from high elevations in the tropics require a cool house, such, for instance, as that in which Filmy Ferns or Odontoglossums thrive, with a temperature ranging from 50° to 75° during the year. Many plants are, no doubt, lost through ignorance of what is required in this particular, the tendency being to give too much heat.

In spore production, Lycopodiums are remarkably prolific, but though it has often been tried in cultivation, no success has attended the attempts at this method of reproduction.

About a score of species appear to have been tried from time to time, but probably not more than a dozen have been in cultivation together at any particular period. Among the most interesting of those that have been tried are the following:—

L. alpinum—closely resembles some of the forms of complanatum. Does well in a shaded corner in an open rockwork. European.

L. Cernuum—this is one of the finest of all the terrestrial species, and one of the most widely distributed in a state of nature. It grows upon any kind of soil, but seems to prefer a rather stiff clay. The situation should be open and fully exposed to sunlight, with plenty of room. The erect branches form dense oblong pyramids, one to two feet high; the branches are very numerous, in tiers, spreading all round the stem, and the abundant small branchlets have each a small sessile fertile cone, recurved at the tip. Stove.

L. clavatum—native of Britain and other parts of the north temperate zone, and abundant at high altitudes in tropical America—where, in parts of the West Indies, it covers many acres, often uninterruptedly. In such places in wading one's way through it, the spores rise in small clouds of yellow dust. Hardy when gathered in Europe, but the tropical forms should have a cool Fernery.

L. complanatum—a recently established British species, a fact long suspected; abundant in tropical America, at high altitudes. Covers the ground thickly with dense virgate branches. It should be treated like clavatum.

L. scariosum and L. Carolinianum are both of the flat-branched section, which do best in wet peat and growing sphagnum. They are rather straggling in growth, and spread prostrate on the ground, throwing up erect or suberect fruiting branches. The former is found both in tropical America and Australia. The latter, from the United States southward. Both require cool Fern-house treatment.

All the foregoing should be grown on a rockwork, or the smaller ones, if desired, in wide pans, allowing room to spread.

L. dichotomum—stem once or twice forked, and generally erect, or nearly so. Leaves much longer than in L. reflexum, which in habit it resembles. It grows in peat and sphagnum Moss, and would thrive in pots or baskets, with a medium temperature.

L. laxum—a slender, pendent, often many-times-forked species, in which the fertile part varies from the slightly modified normal branch to a distinct quadrangular condition; it should be suspended in peat in stove heat, as it belongs to the tropical Pacific islands.

L. linifolium—a very flaccid plant, so much so that it might be rolled into a ball in the palms of one's hands without injury. The leaves are linear-acuminate, very large, the stems slender almost as thread, repeatedly forked and very pendent. Requires a basket and peat, with tropical heat.

L. mandiocanum—this is united with dichotomum, which it closely resembles, at Kew. It varies in growth and foliage in different regions, is either erect or pendent in habit, and does best in moist peat and sphagnum. Grown in pot or basket.

L. phlegmaria—like phyllanthum in habit. The fertile portions are exceedingly slender and repeatedly forked. It belongs to Australia and Polynesia, and should be treated as a stove plant.

L. phyllanthum—in this the fertile portion is transferred into tassel-like clusters at the ends of the branches. It is a fine robust species, and should be treated in all particulars like L. laxum.

L. reflexum—a terrestrial species, with stiff, generally erect branches, two or more times forked, extending close together. It grows in damp but ordinary soil. The leaves become reflexed after a short time. Temperature about 55° to 80°, and plenty of light.

L. selago—a small tufted, simple stemmed or dichotomous, terrestrial species. Does well on an open rockwork in peat. It is found in Britain, and is widely diffused in the north and south temperate zones.

L. taxifolium—one of the most robust species, with flat linear-acuminate leaves, and divaricating repeatedly forked branches. It should be grown in peat, in pot or basket, in a cool house, or with moderate heat, affording shade.

L. verticillatum—this is remarkable for its numerous short, stiff, often forked, much divaricating slender branches, with short subulate leaves. It will do well in either pot or basket, but should be elevated above surrounding plants. Requires a mean temperature.

There are numerous beautiful tropical and warm temperate species, which have never been tried in cultivation, but which would be well worth the trouble of introducing to our gardens. The cultural requirements described for the foregoing species would apply also to these, and in fact, if discrimination be used, cover all that is required in the entire family.

MOSSES.

THE name Moss has been indiscriminately applied to a host of different plants of tufted habit belonging to widely different families. For instance, the Spanish or Florida Moss, which hangs in long masses from the branches of trees in the warmer parts of the New World, is a Phanerogamic plant, *Tillandsia usneoides*. Reindeer Moss, Iceland Moss, and the Irish Moss of commerce are Lichens. The true Mosses constitute a large group of flowerless plants, or Cryptogams, of considerable interest both on account of their singular structure and their very varied and often beautiful forms. From a purely economic standpoint, the family perhaps yields fewer objects of utility to man than any other.

The species occur in all parts of the world, and thrive on high mountains long after all Phanerogamic vegetation has ceased; they are exceedingly numerous—nearly six hundred are found within the limits of the British Islands—vary remarkably in size, and are either annual or perennial. Some of the British species are quite as beautiful as many Filmy Ferns, and not a few exotic ones would thoroughly repay the trouble of introduction. Very few of the latter have, in all probability, ever been tried by English gardeners; enthusiasts have, however, succeeded to a greater or less extent with the native ones.

Attractive and luxuriant as are so many of our common Mosses in a state of nature, and, as a casual observer may be led to believe, therefore of easy culture, they are nevertheless by no means easy to grow with any degree of success under the widely different conditions which generally obtain artificially. In this article a few hints as to the species most likely to please, and the best way in which experience has taught the writer to treat them, will be given.

Cultivation, &c.—If no special structure is forthcoming, many Mosses may be readily grown in a cold frame, or among other plants in a cool, shaded Fern-house. Several (many of the Hypnums, for instance) grow thoroughly well on a piece of rock or brickwork, moved from the natural locality in a piece. In building an in-door Fernery it is as well to use a few Moss-covered stones here and there. In a short time the other pieces of rock will become clothed with a covering of Moss plants, amongst

which the rhizomes of creeping-rooted Ferns will luxuriate.

Any Moss which, in the woods or other spots where Mosses abound, may strike the finder's fancy, should be lifted with a good portion of the soil, and planted in a thoroughly drained medium-sized pot. The base of the tuft should, in case it has not been removed with soil sufficient, be placed in immediate contact with such material as most nearly resembles that on which it naturally grows. This is somewhat important, as although some grow in almost any soil, others affect more or less a particular one. The smaller-growing rock species simply require to be taken with the stone on which they grow; the larger ones should be fastened on similar stones, with wire or some other contrivance, until they have attached themselves. The moisture-loving ones, such as some of the Bartramias, the water-loving Hypnums, and Dicranums, should have the pots kept in saucers filled constantly with water, by which means their roots are regularly supplied with water. All are better with pretty frequent syringings of rain-water. Most of the kinds are in a state of rest, more or less definite, during the summer months; these can then be placed on ashes behind a north wall, and left to themselves without further care than an occasional watering. In order, however, to prevent birds from rooting up the tufts in search of insects and worms, and thus interfering materially with the welfare and appearance of the plants, it is well to have netting fixed over them in such a way as to prevent the incursions of such unwelcome visitors.

Hypnum tamariscinum and its allies make beautiful objects if kept in a moist, shaded spot, and not a few Hypnums thrive on turves of fibrous peat. The Hookerias, too, grow freely either on moist stones or in prepared pots of small pieces of almost any porous stone. In a well-shaded case in which Ferns succeed, pieces of wood or Moss-covered branches may be placed, and the wonderful variations in colour, in the length, direction, and form of their stems and branches—not to speak of the differences in the capsules—cannot fail to appeal to the admiration of all who love plant-life. *Hypnum splendens*, well established, makes a specimen which for grace and delicacy can hardly be surpassed. *Climacium dendroides*, with its erect stems and feathery dark green foliage, is quite as charming as any miniature Fern. It requires a well-drained fibrous peat, and abundance of moisture.

The following is a list of a few of the species most readily grown, and, at the same time, some of the more striking and distinct of our British Mosses, not mentioned in the preceding paragraphs. A few words as to the aspect of the plant and the habitats it affects are also given:—

Anæctangium ciliatum — frequent on rocks, &c., in hilly districts. Conspicuous by the projecting hairs of the leaf, which give a hoary appearance to the tufts.

Andræa rupestris—a somewhat sombre-hued, brownish tufted Moss, so common on rocks in some mountainous districts as to give quite a character to the scenery.

Anomodon curtipendulum—a fine Moss, with dark green foliage; rocks and trees chiefly in mountainous districts.

A. viticulosum—a much less vigorous grower than the last, with soft pale green tufts.

Bartramia pomiformis — the common Apple Moss of rocks and dry banks. It has pale green foliage, and pretty rounded capsules, which suggested its English name.

B. ithyphylla, an allied species from more hilly districts, has deeper green leaves.

Bryum argenteum grows on wall-sides, roofs, indeed almost everywhere. It has deep silvery-green tufts. A number of other Bryums are wonderfully pretty when well grown.

D. heteromollum is common in lowland woods, and its dense velvety carpet of dark green is very attractive.

Dicranum pellucidum is found by rivers and streams. It has yellowish-green, almost transparent leaves.

D. squarrosum grows in wettish spots on mountains.

Eucalypta vulgaris is the Extinguisher Moss, so called on account of the resemblance of its pale green cap or calyptra to an extinguisher. Not uncommon on banks and wall-tops.

Funaria hygrometrica is found on walls and rocks, and on the ground, especially where wood has been burnt. It grows in pale green patches, which contrast markedly with the orange or reddish colour of the ripe capsules.

Grimmia apocarpa is common on rocks, wall-tops, and trees. It makes good-sized dark brownish-green tufts.

G. pulvinata forms small, dense, hoary cushions.

Hookeria lætevirens has darker green foliage than the commoner H. lucens. Both grow on shaded, moist banks, &c., and have beautiful pellucid leaves.

Trichostomum heterostichum, the Hoary Fringe Moss, forms beautiful hoary patches on stony ground chiefly in mountainous districts.

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